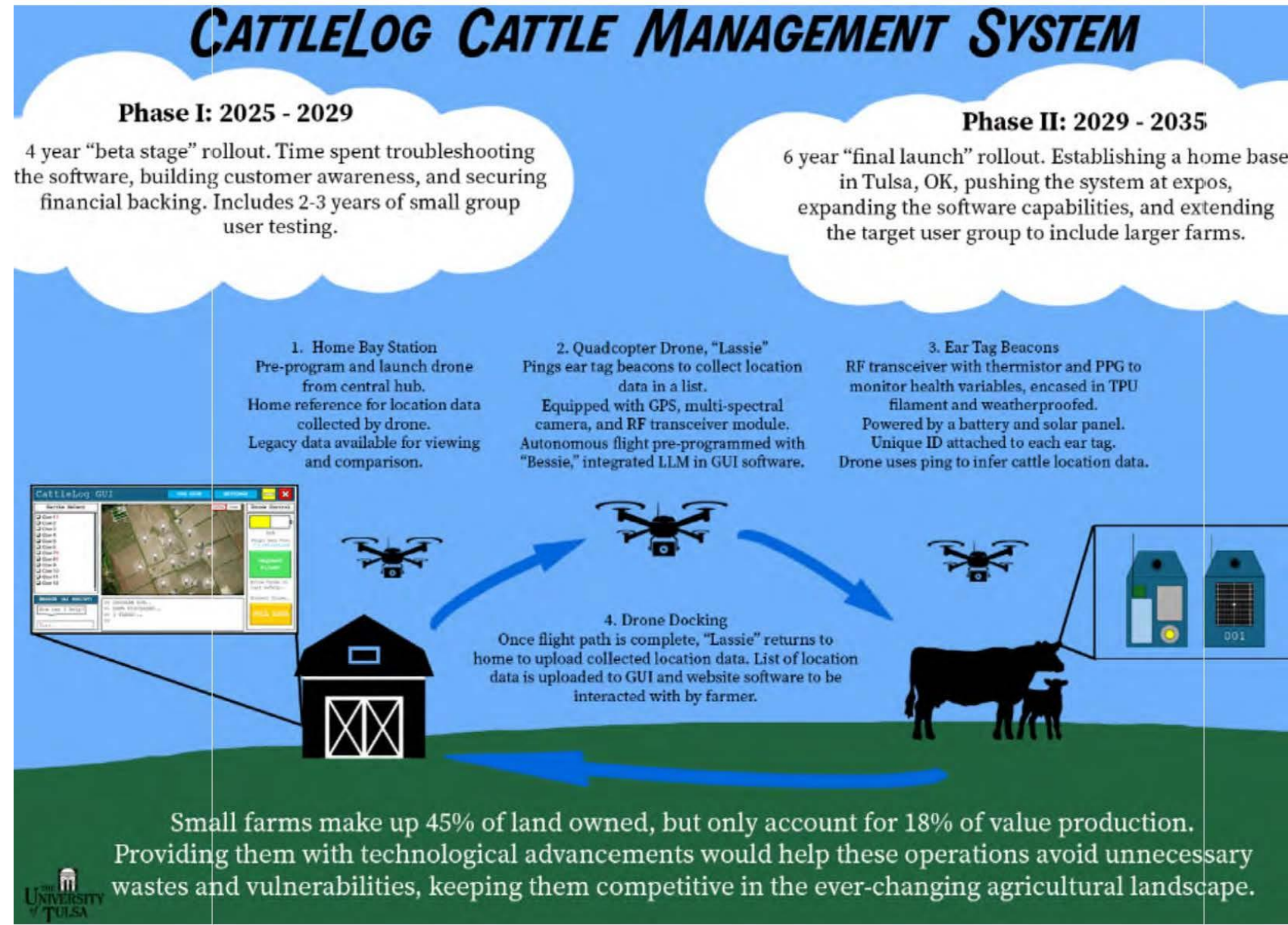


# University of Tulsa

## “CattleLog Cattle Management System”





# ***CattleLog Cattle Management System***

The University of Tulsa

Faculty Advisors: Marie Moran and William Lepage





# Meet The Team



Nate Husen



Katie Eugenio



Kaylee Kapche



TJ Knight



Anthony Fatigante

# Research and Use Case



# Research – In The Field





# Research – In The Field



Scott Abbott



Mike Snyder



Dixie Snyder



# Research – In The Field





# Research – In The Field





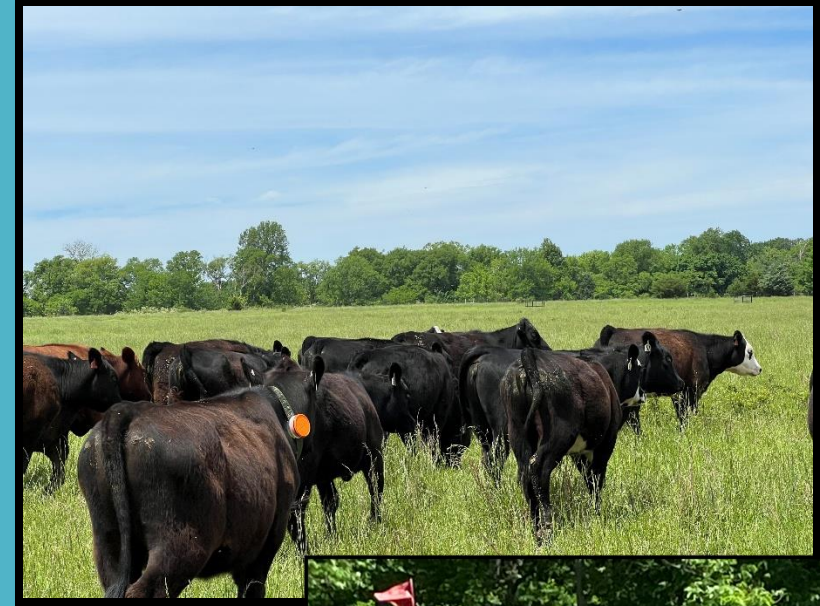
# Research – In The Field





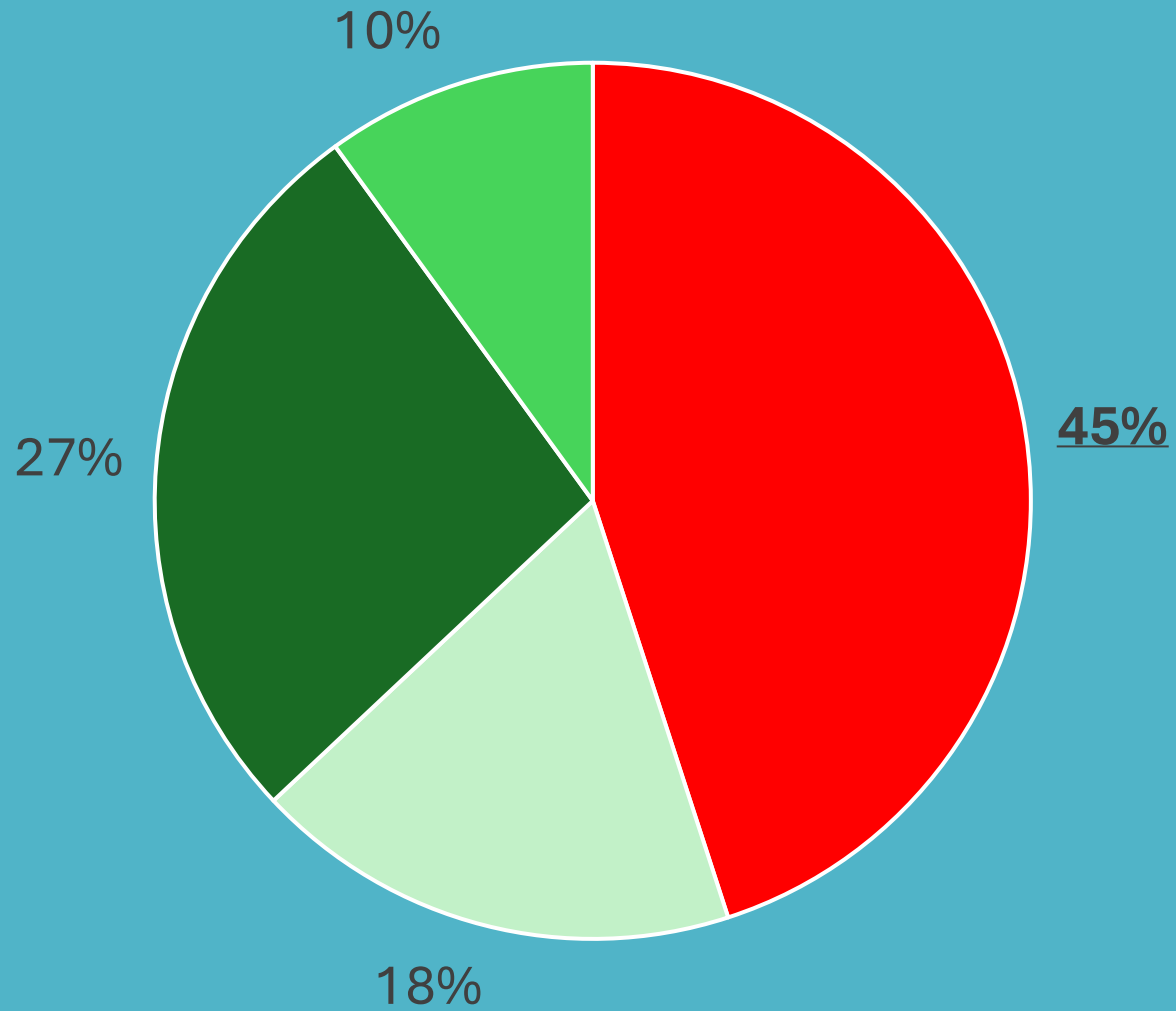
# User Group

- Small Cattle Farms.
  - ~100 head of cattle
  - ~40-acre plots
  - < \$350,000 annual income
  - Cattle comprise 81% of livestock farms in OK.

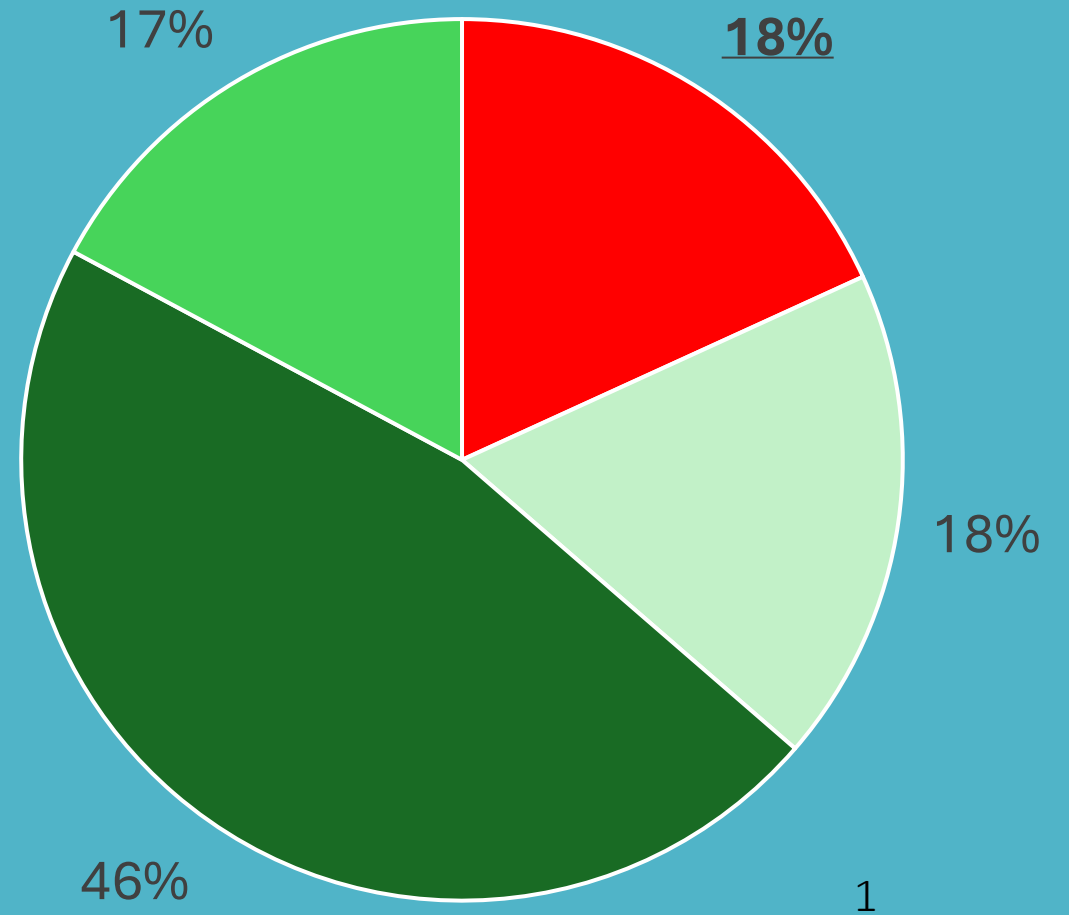




### Land Owned



### Value of Production



■ Small Family Farms  
■ Large-Scale Family Farms

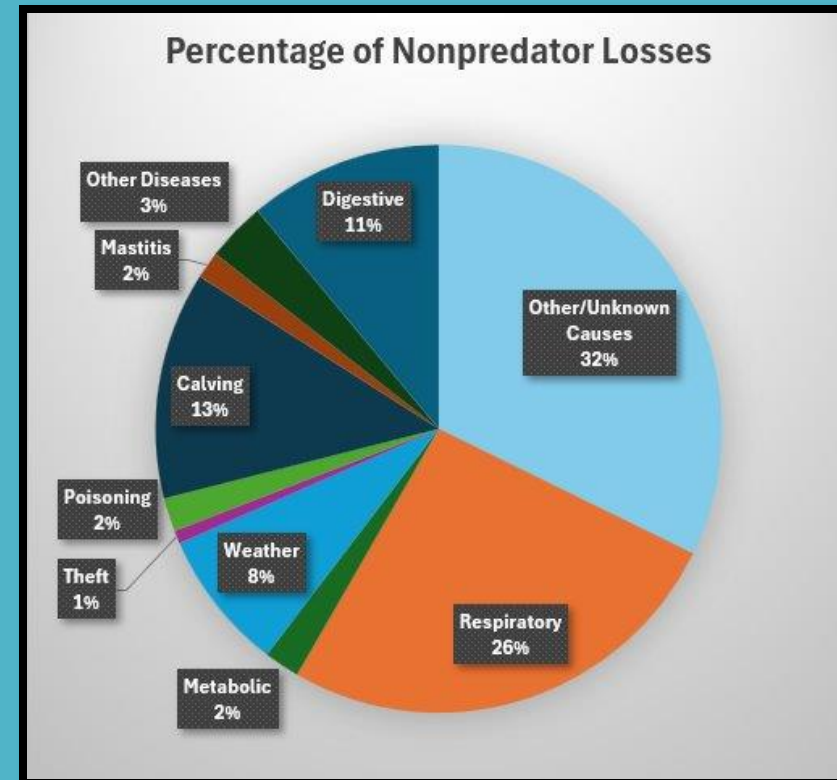
■ Midsize Family Farms  
■ Nonfamily Farms

[USDA 2014 Census Data](#)



# Need 1: Optimization

- Affordable technology designed for small farms can help close this gap.
- Identified Wastes:
  1. Labor
  2. Defects





# Need 2: Environmental Impact

- The proposed system can use novel techniques to improve environmental impact.
- Resurgence of Dust Bowl Conditions
  - Caused by overgrazing and soil erosion.





# What is on the Market?

Primary Competitors (GPS Trackers):

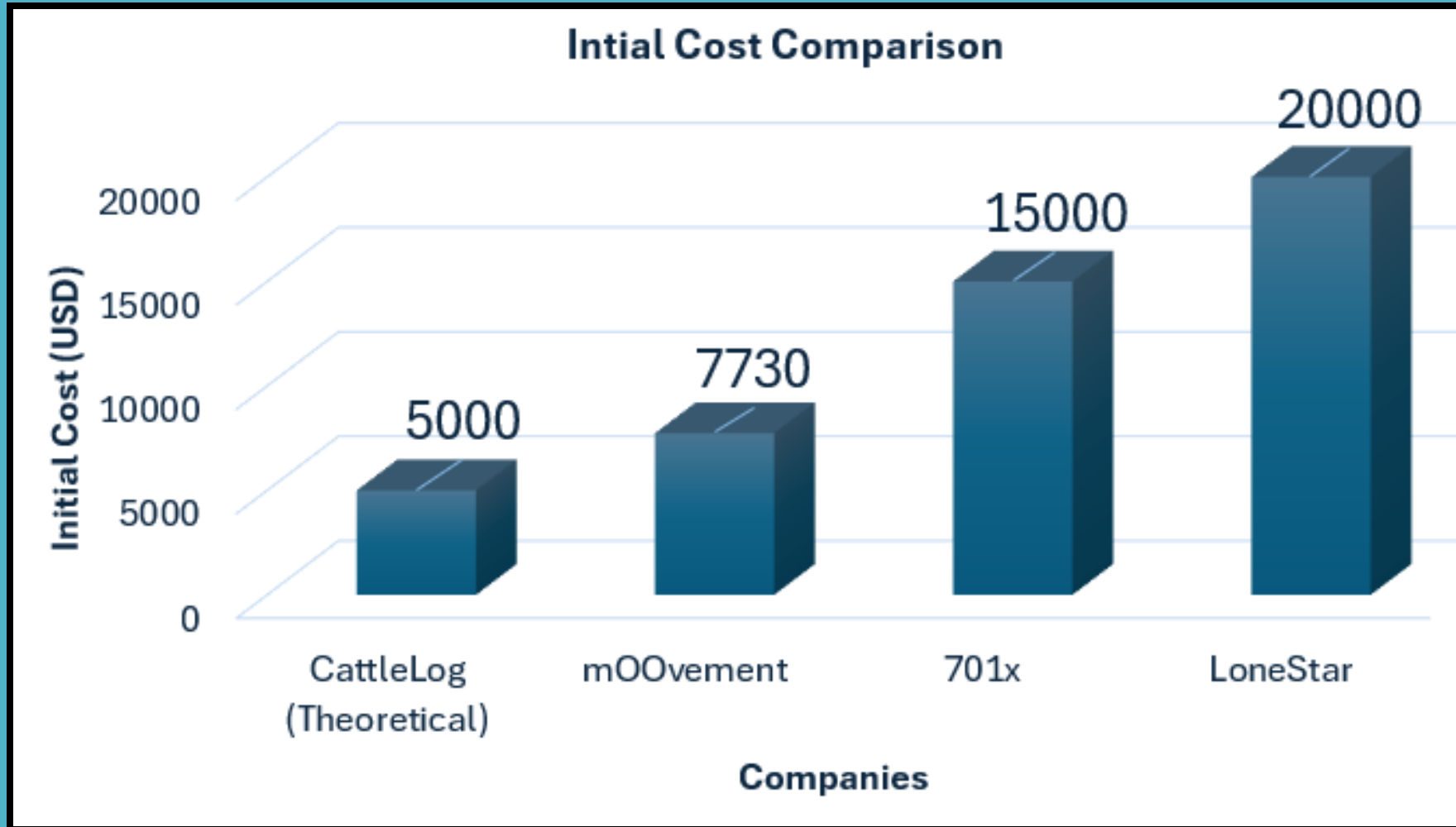
1. 701X
2. LoneStar Tracking
3. mOOvement





# What is Affordable?

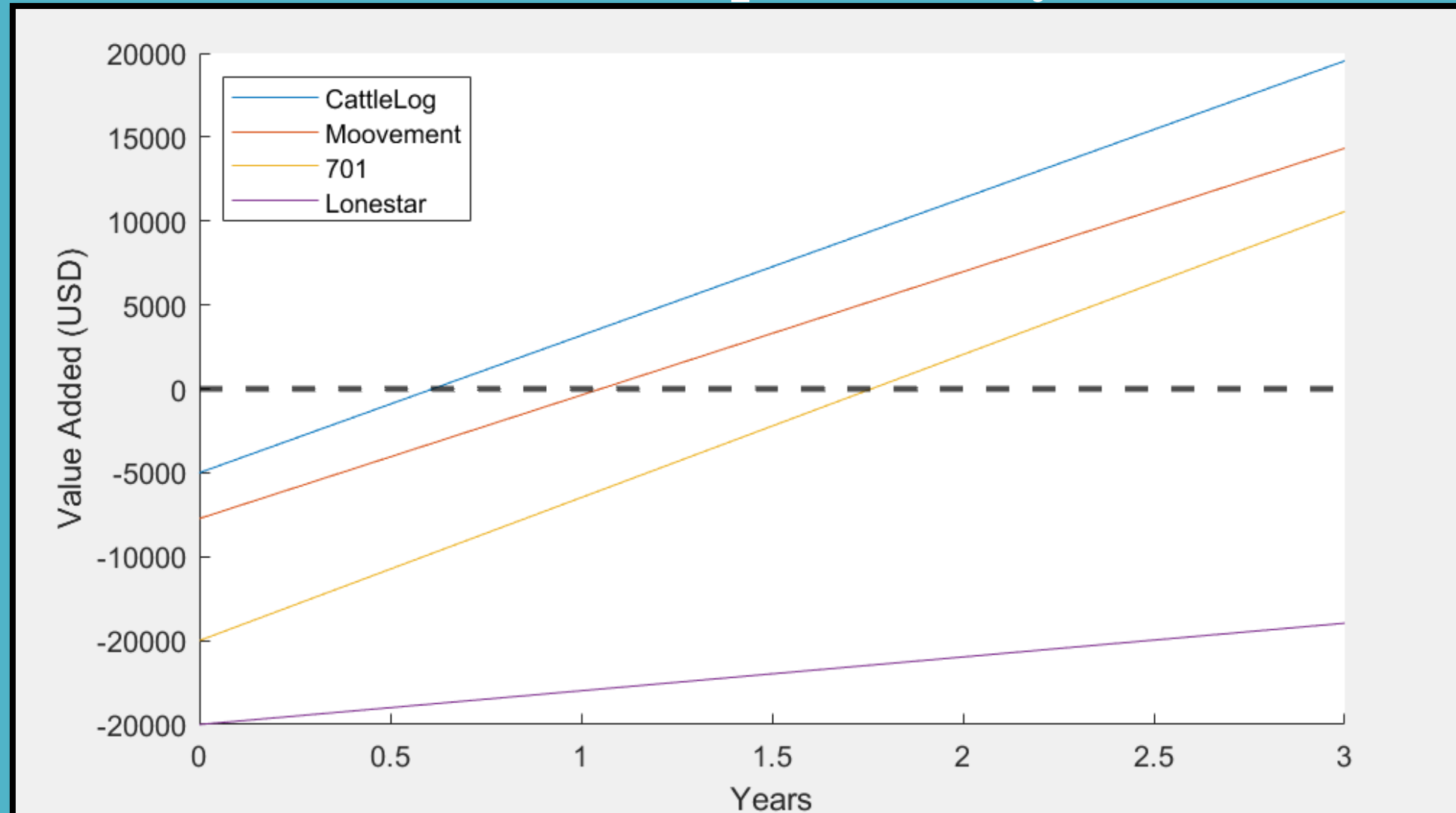
Proposed System Price: \$5000.00





# What is Affordable?

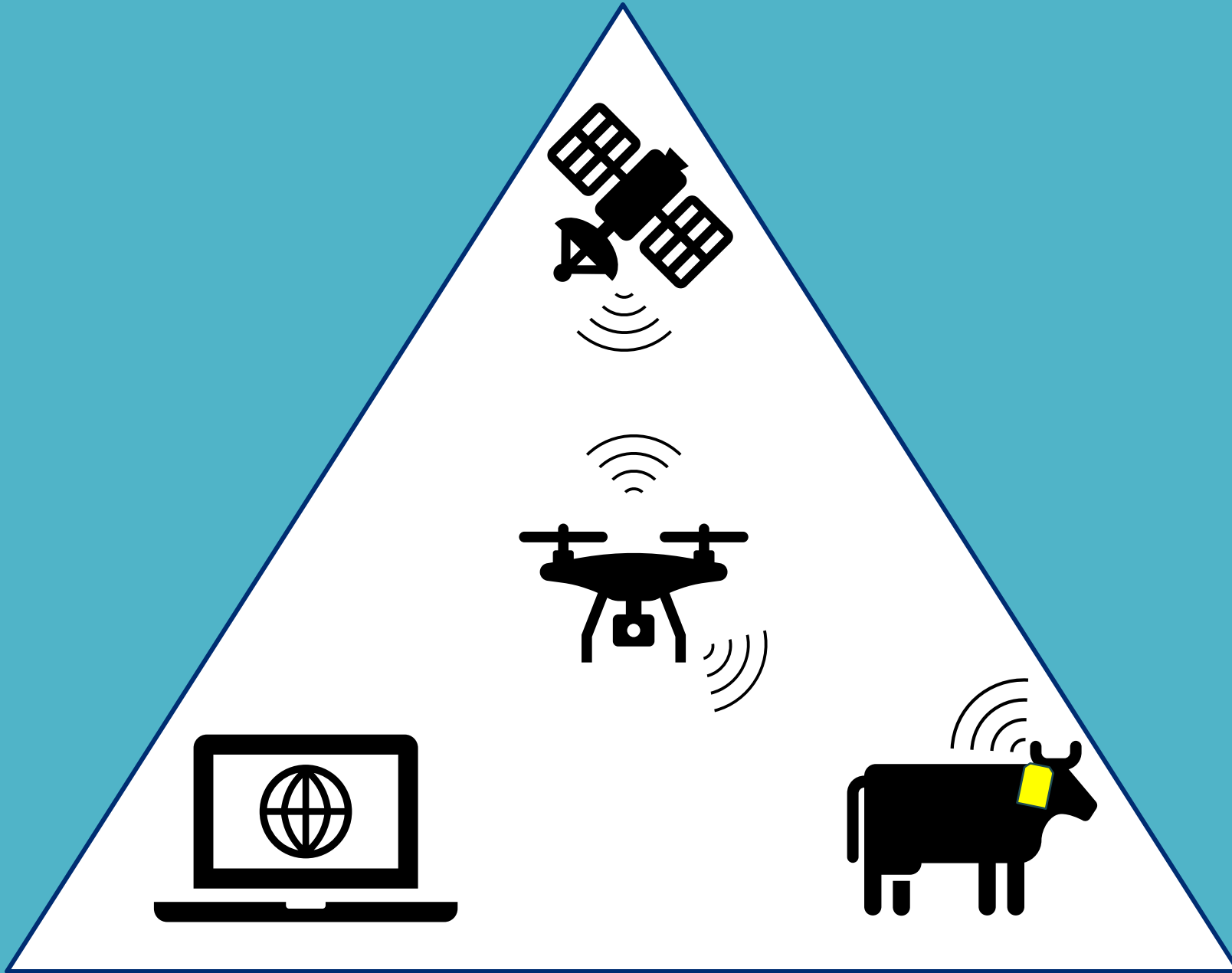
Time to recoup cost: <1 year

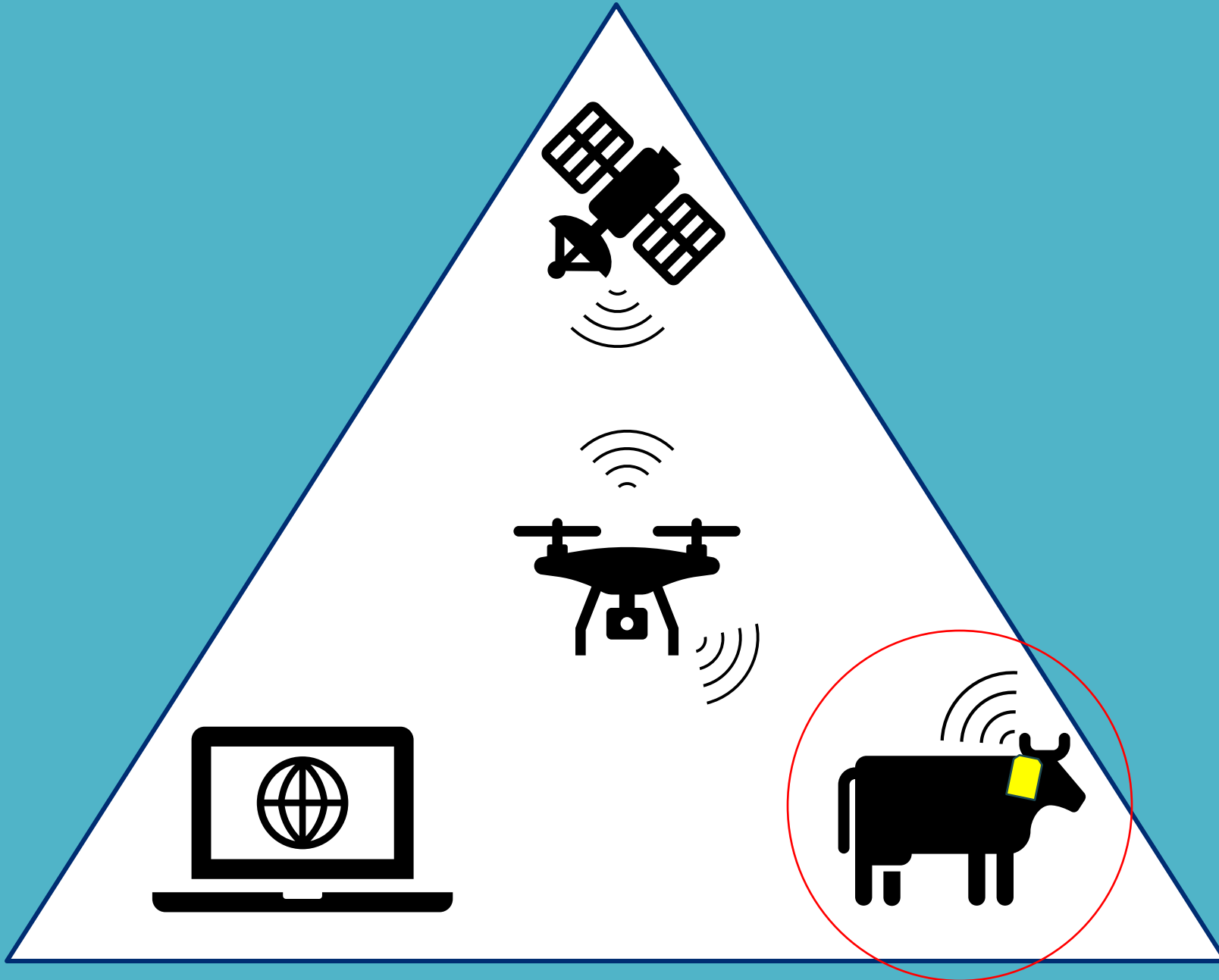




# Proposed Solution

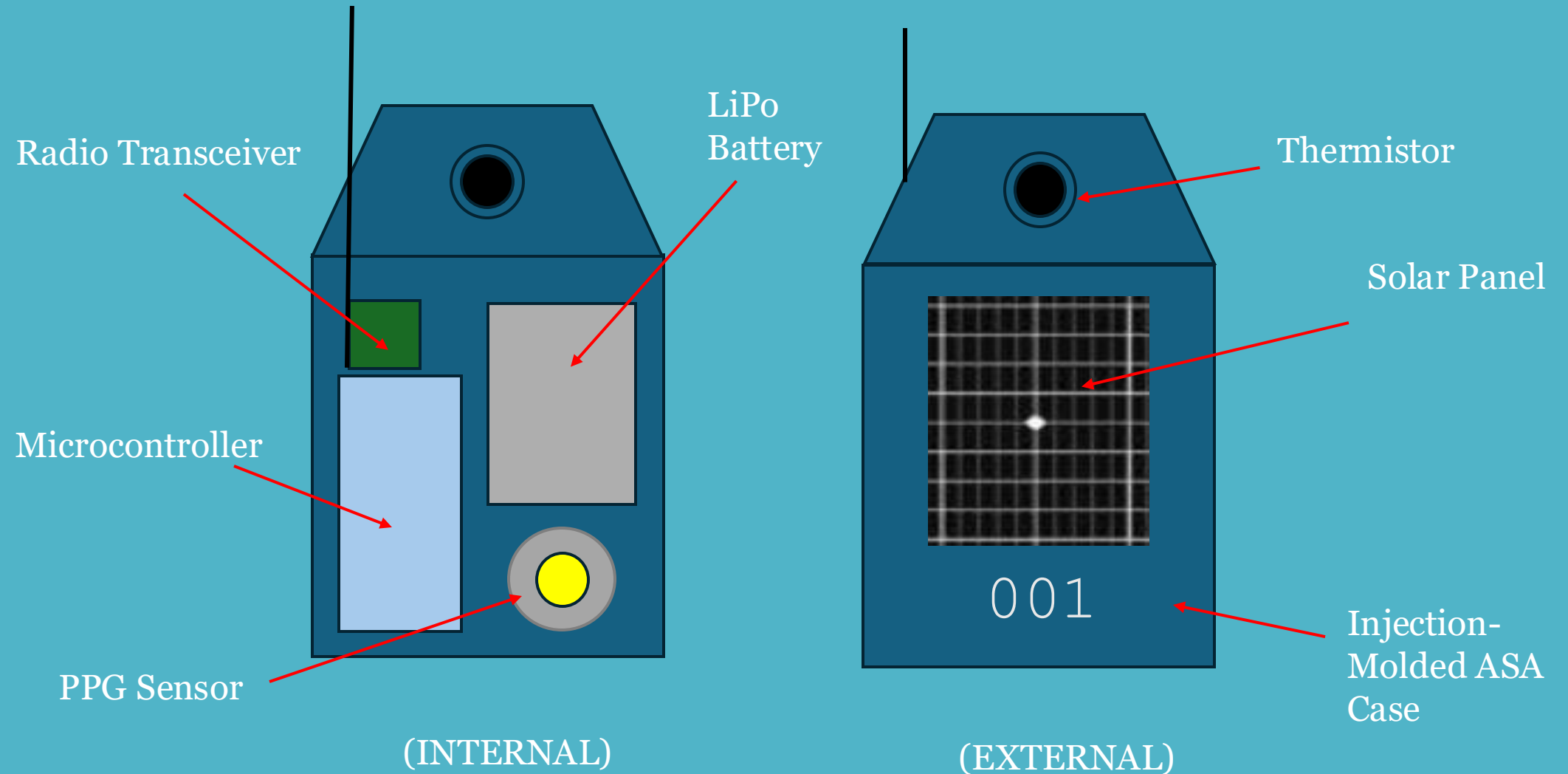








# Tag Beacons

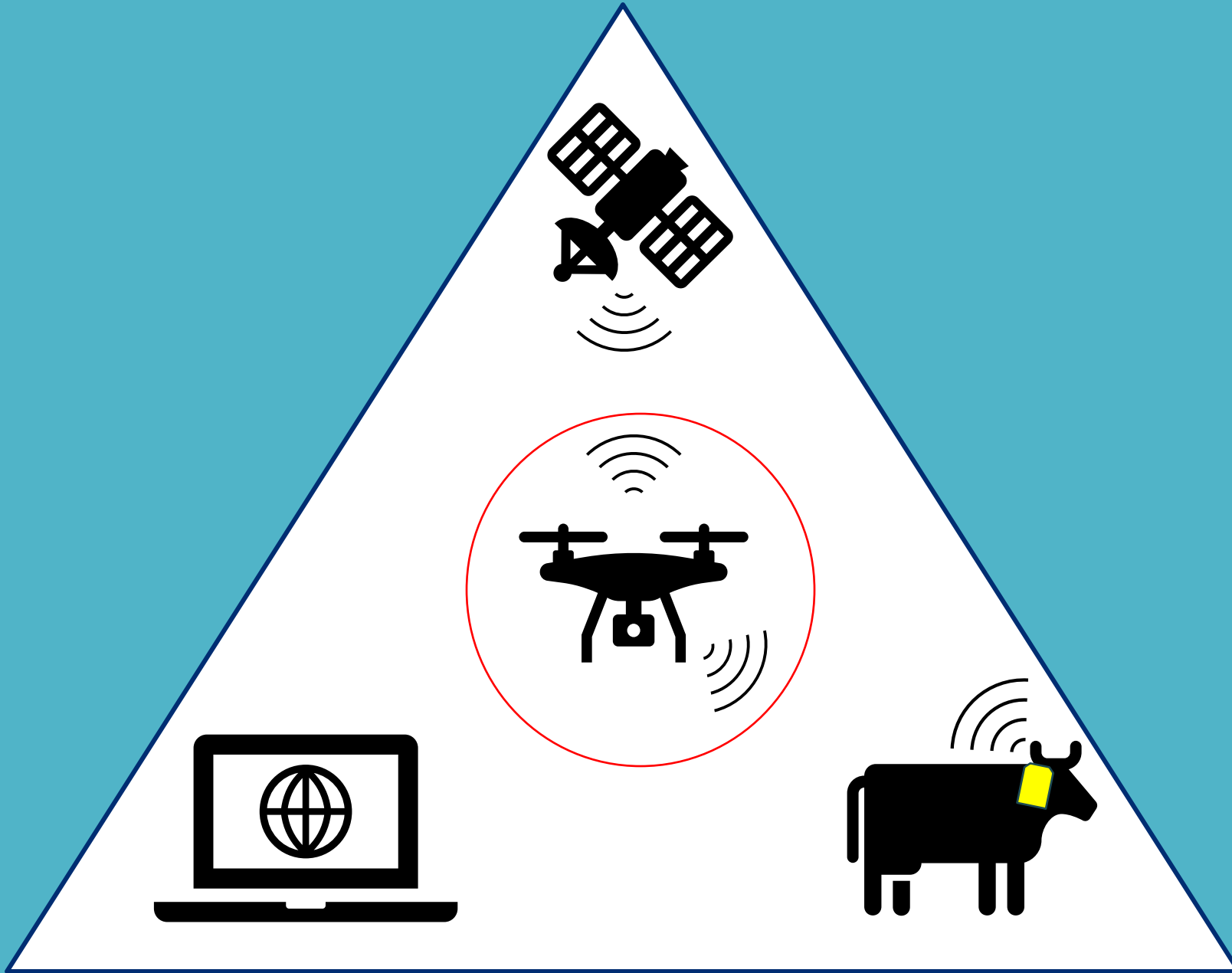


# Tag Beacons

## Capabilities:

1. Health Monitoring through PPG Sensor and Thermistor.
2. Tracking via Active RF
3. Passive Recharge through Solar Panel
4. Compatible with Applicators already on market.





# Modified Quadcopter Drone

- Modified, autonomous drone programmed to fly on a custom flight path.
- WHY?
  - Integrated Global Positioning System
  - Reprogrammable Flight Path
  - Altitude and Terrain Control
  - Integrated Multispectral Camera





# Modified Quadcopter Drone

**Collects and transmits two sets of data during flight:**

1. Cattle Location and Sensor Data (NEED 1)
  - Using Integrated GPS and Radio Frequency to communicate with tag beacons.
2. Food Source Availability (NEED 2)
  - Using multispectral imaging to determine foliage density from the air.

# Modified Quadcopter Drone

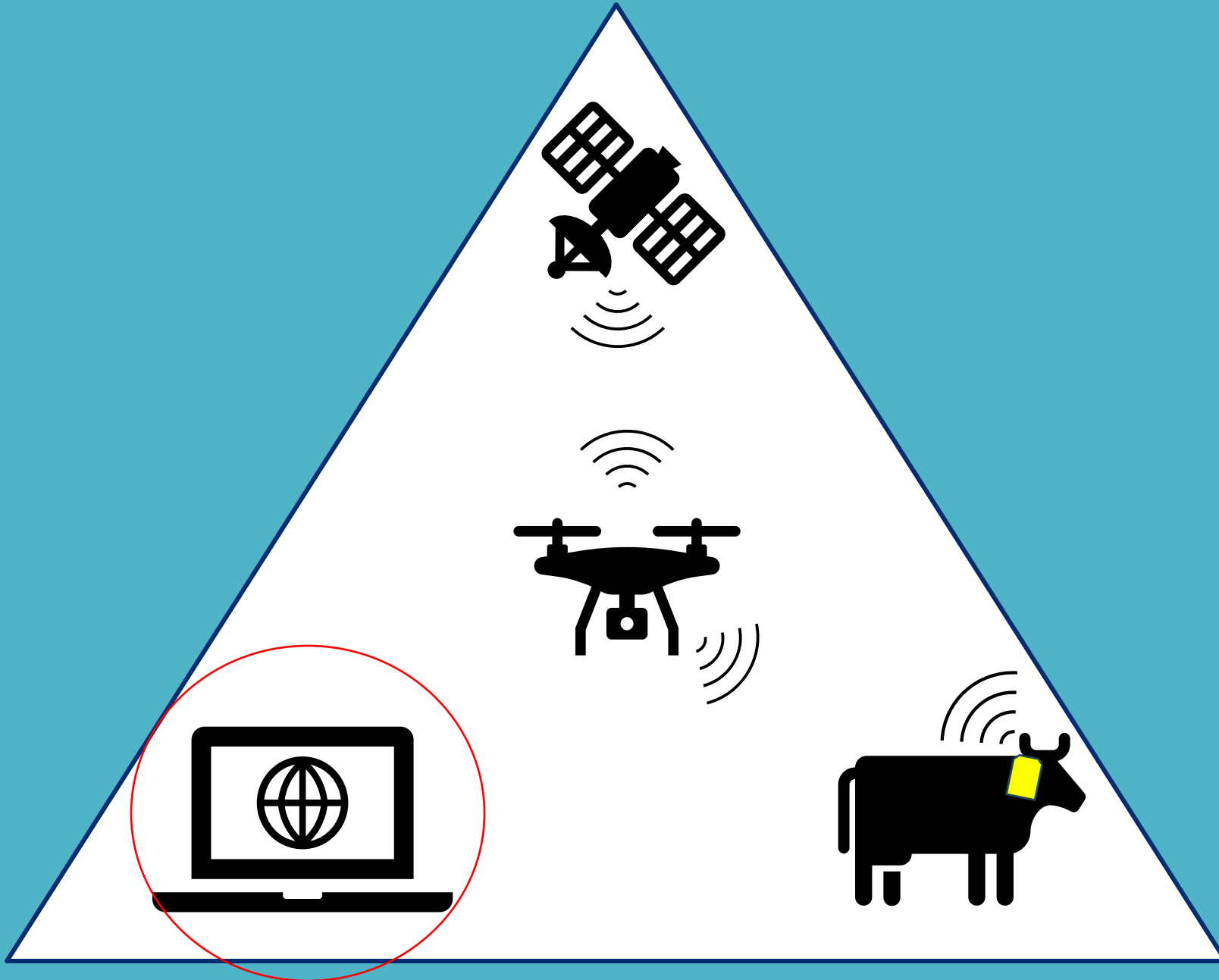




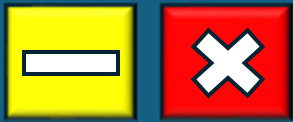
# Modified Quadcopter Drone

- Flight Paths Managed by CattleLog Pilots
- Relies on Part 108 Regulation
  - Autonomous drone flight beyond line of sight.
  - Intended for applications like Amazon's autonomous drone delivery concept.
- Notice of Proposed Rulemaking
  - Expected 2025<sup>8</sup>









## Cattle Select

- ☐ Cow 1 !
- ☐ Cow 2
- ☐ Cow 3
- ☐ Cow 4
- ☐ Cow 5
- ☐ Cow 6
- ☐ Cow 7 !
- ☐ Cow 8 !
- ☐ Cow 9
- ☐ Cow 10
- ☐ Cow 11
- ☐ Cow 12



## BESSIE (AI ASSIST)

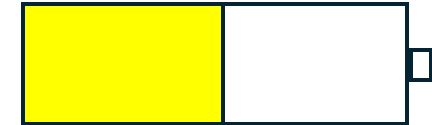
How can I Help?

I...



```
>> PROGRAM RUN..  
>> DATA DISPLAYED..  
>> 3 FLAGS!..  
>>
```

## Drone Control



55%

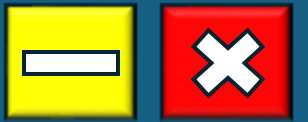
Flight Path File:  
[2\\_2\\_25fltpth.px4](#)

**REQUEST  
FLIGHT**

Allow Drone to  
land safely..

Connect Drone..

**PULL DATA**



## Cattle Select

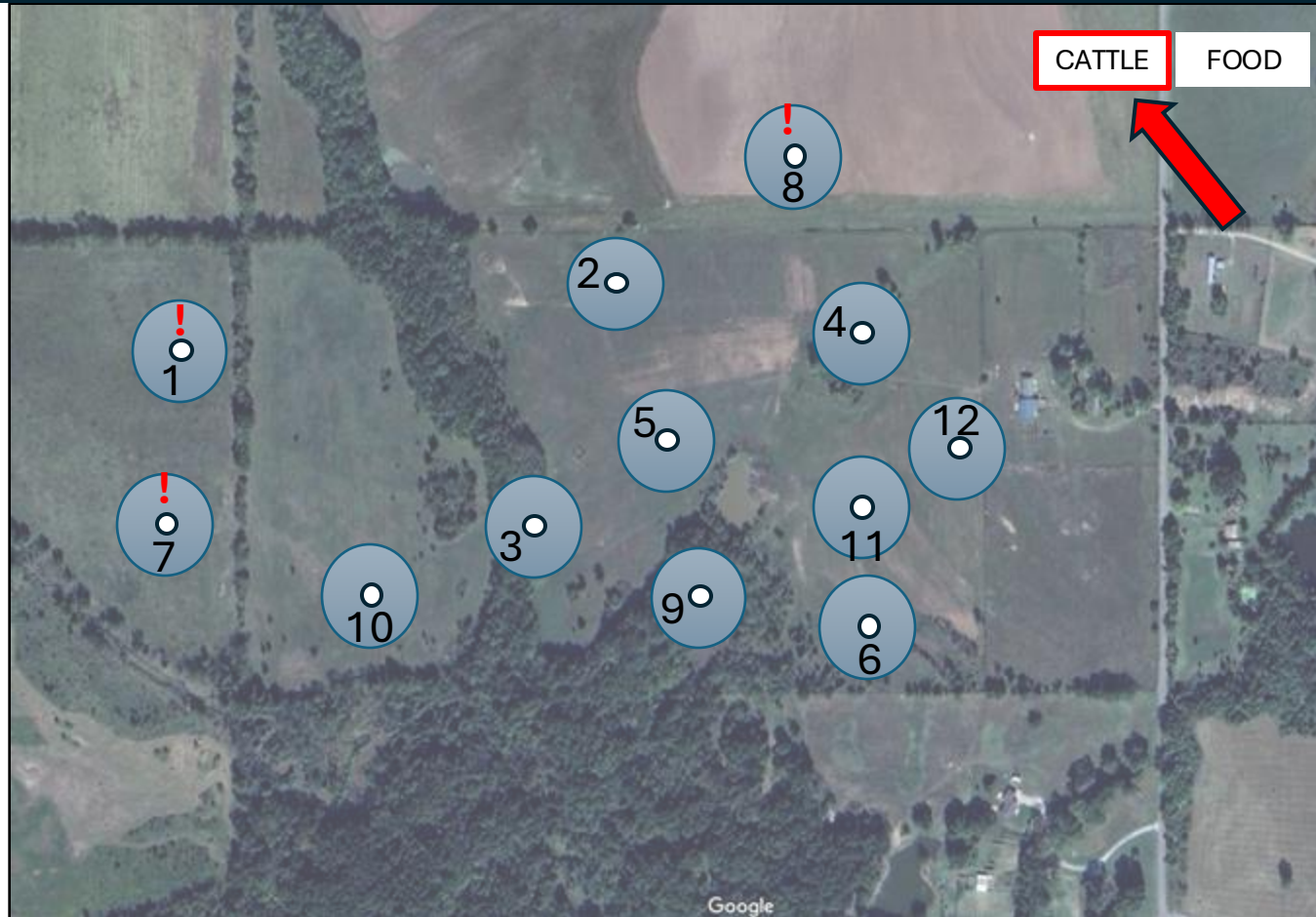
- ☐ Cow 1 !
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- ☐ Cow 10
- ☐ Cow 11
- ☐ Cow 12



## BESSIE (AI ASSIST)

How can I Help?

I...



CATTLE

FOOD

## Drone Control



55%

Flight Path File:  
[2\\_2\\_25fltpth.px4](#)

REQUEST  
FLIGHT

Allow Drone to  
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Connect Drone..

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```





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- ☐ Cow 12



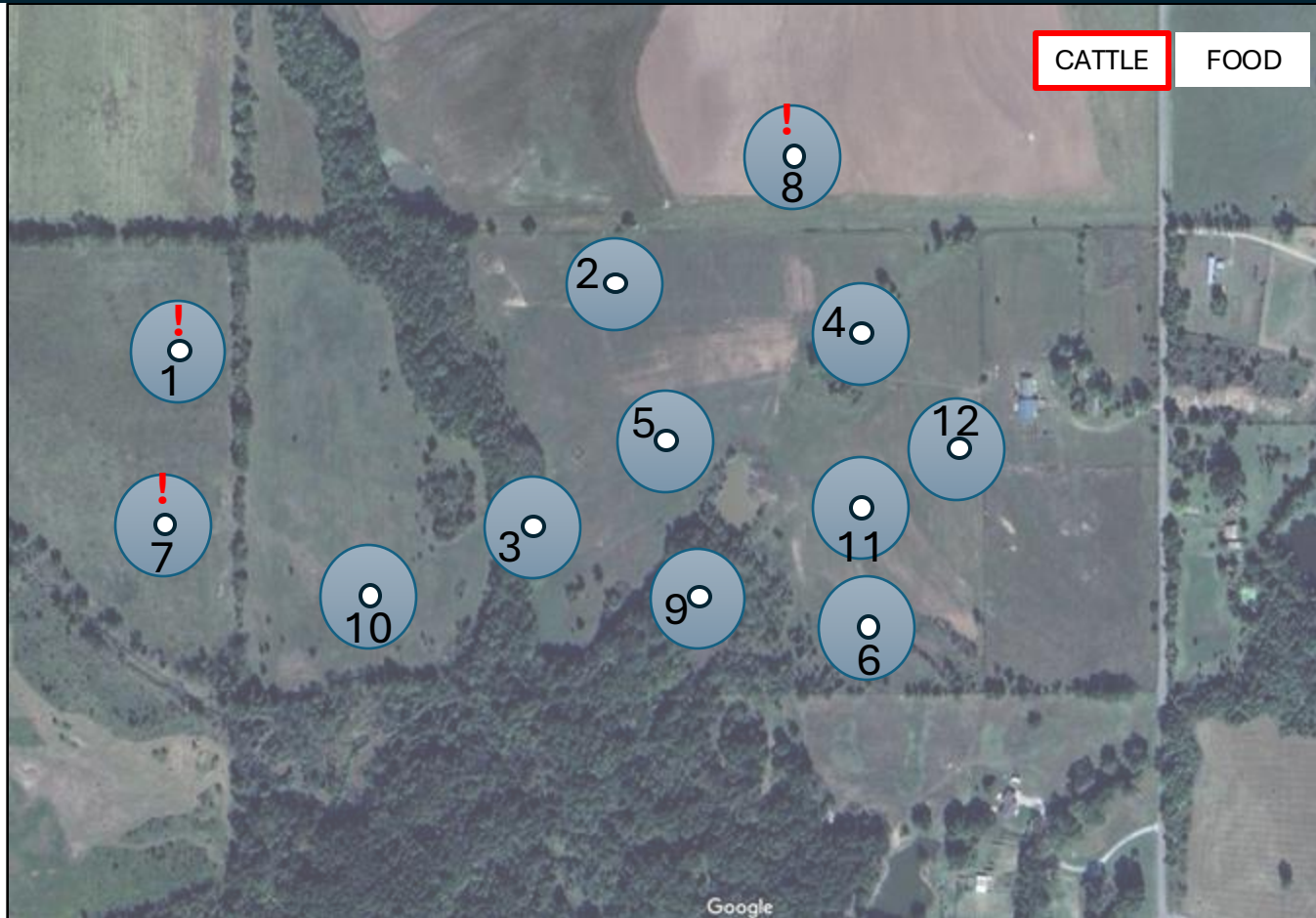
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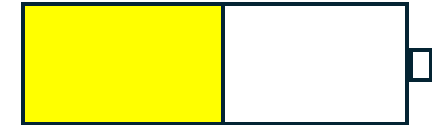
CATTLE

FOOD



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## Drone Control



55%

Flight Path File:  
[2\\_2\\_25fltpth.px4](#)

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FLIGHT

Allow Drone to  
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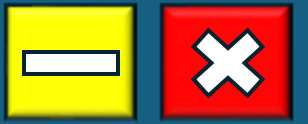
Connect Drone..

PULL DATA

# CattleLog GUI

OUR SITE

SETTINGS



## Cattle Select

- ☐ Cow 1 !
- ☐ Cow 2
- ☐ Cow 3
- ☐ Cow 4
- ☐ Cow 5
- ☐ Cow 6
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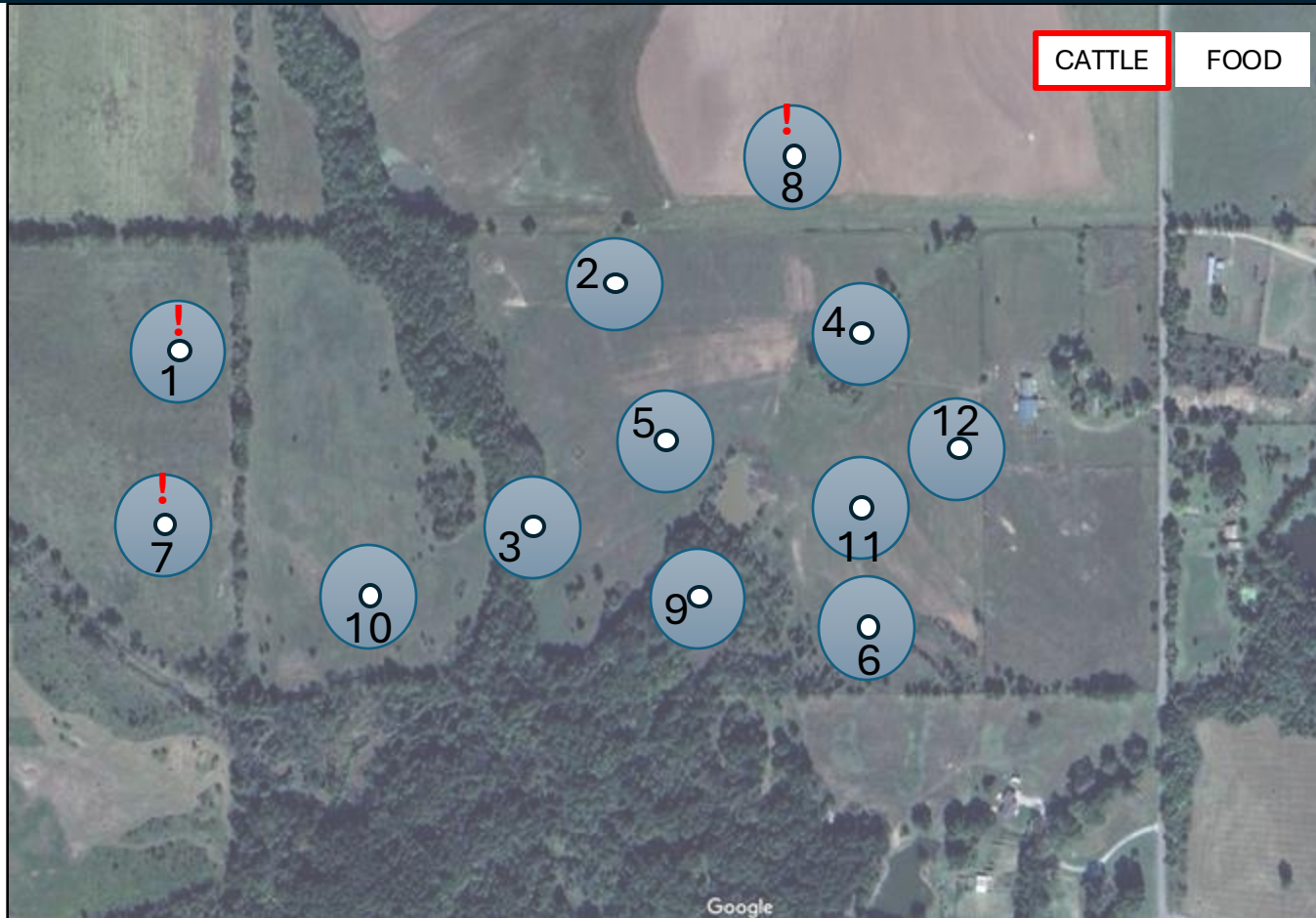
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55%

Flight Path File:  
[2\\_2\\_25fltpth.px4](#)

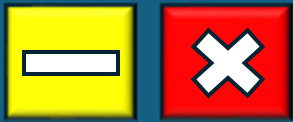
REQUEST  
FLIGHT

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Connect Drone..

PULL DATA





## Cattle Select

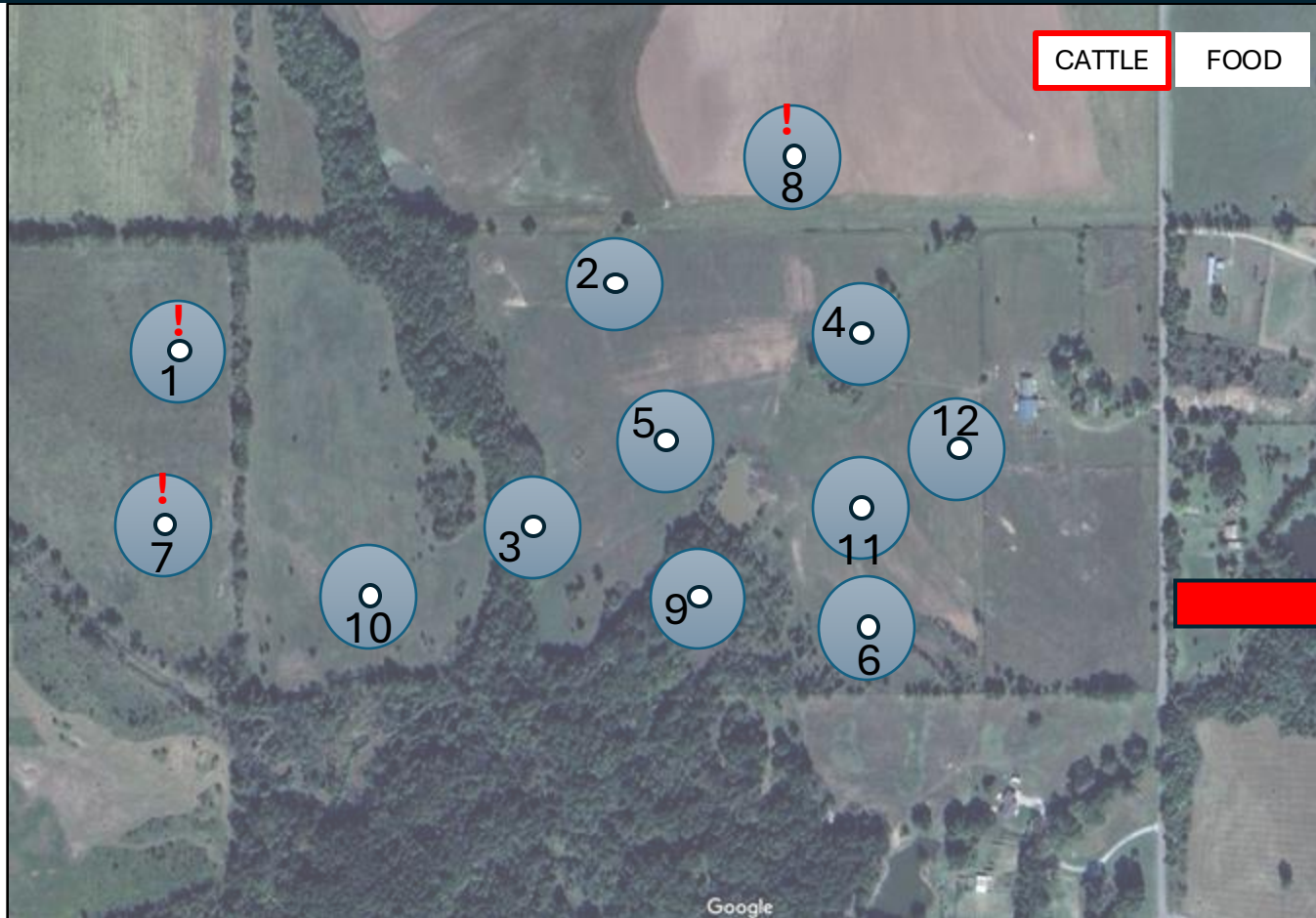
- ☐ Cow 1 !
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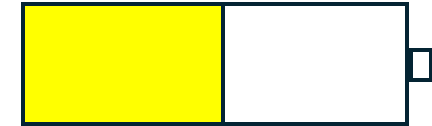
How can I Help?

I...



```
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55%

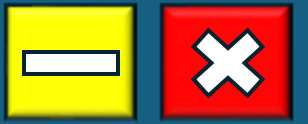
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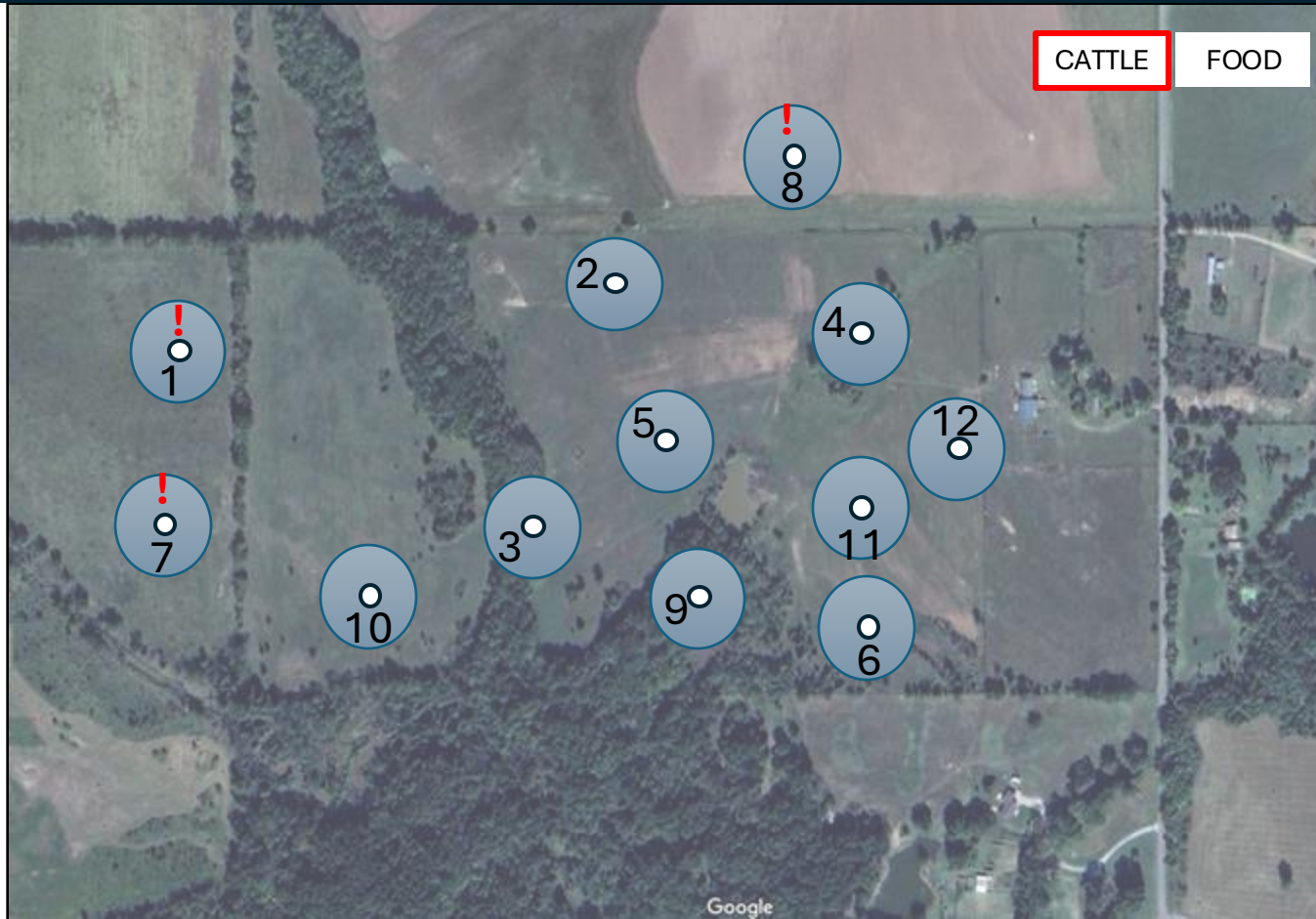
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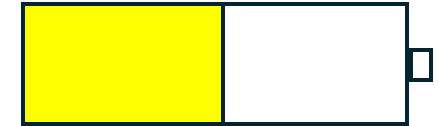
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55%

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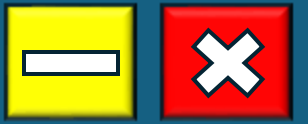
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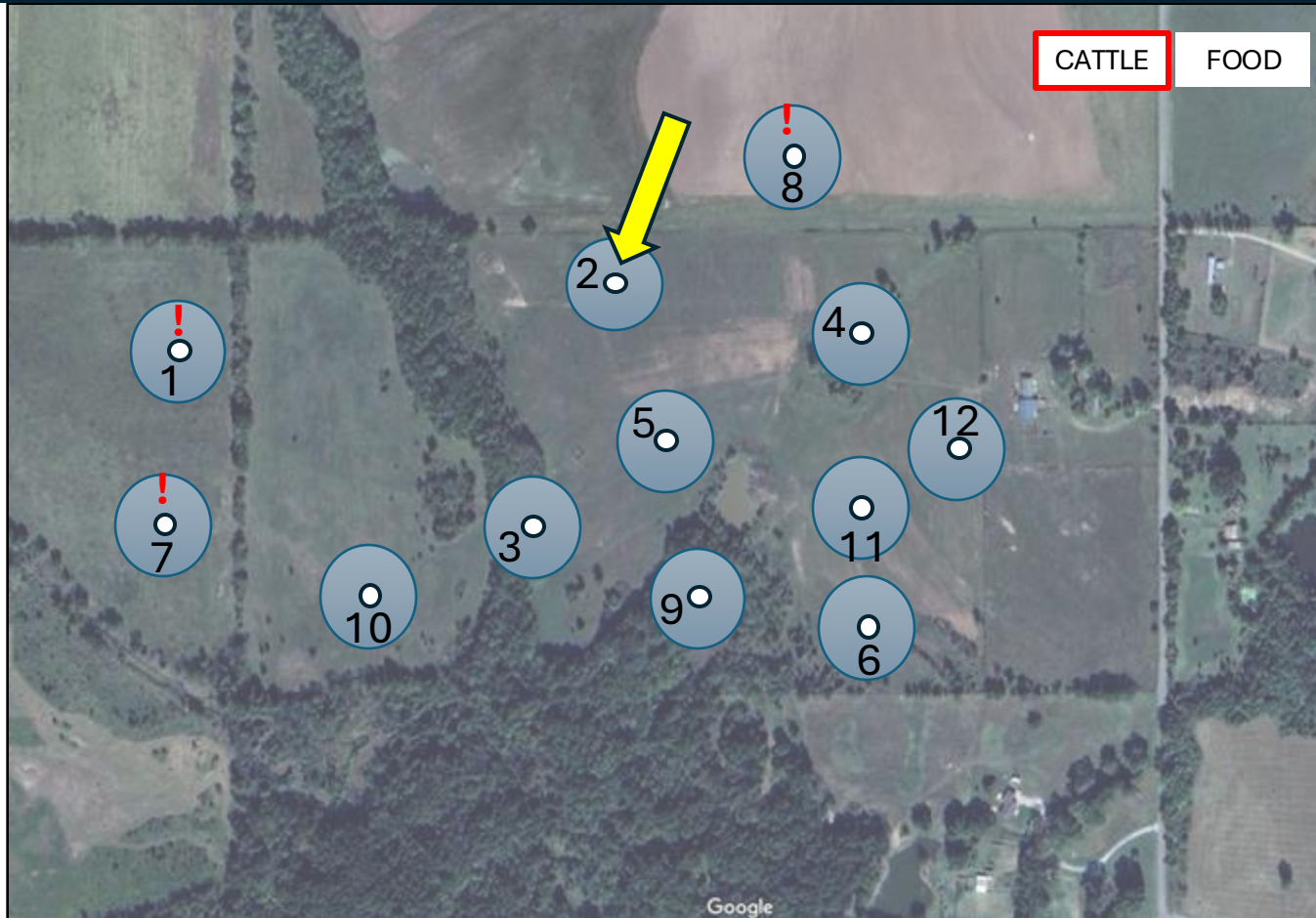
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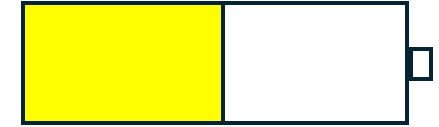
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55%

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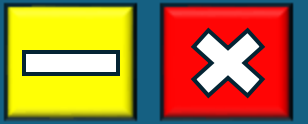
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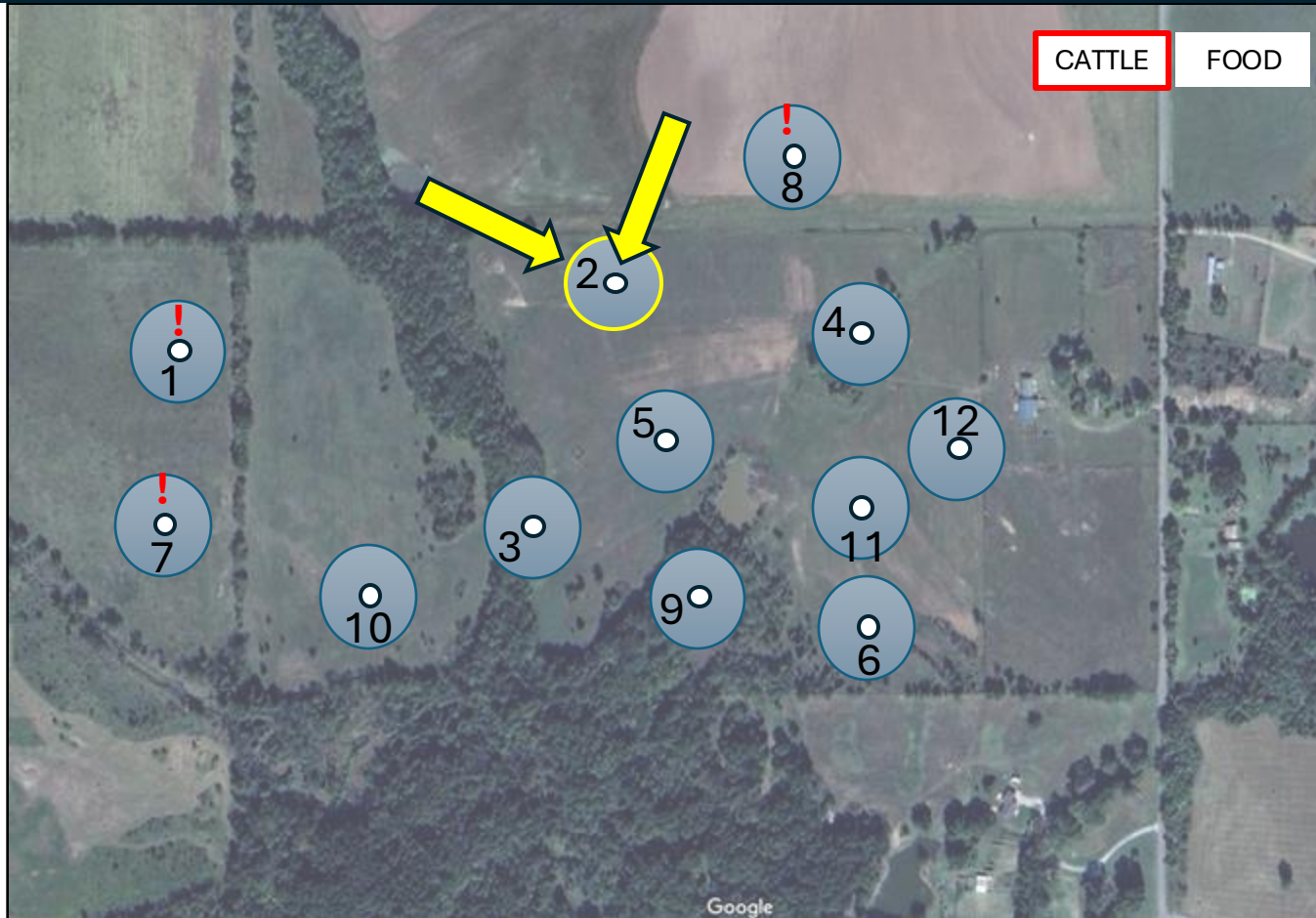
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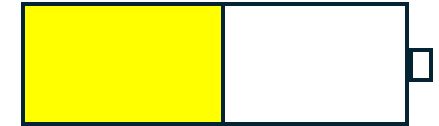
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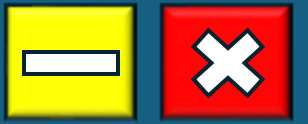
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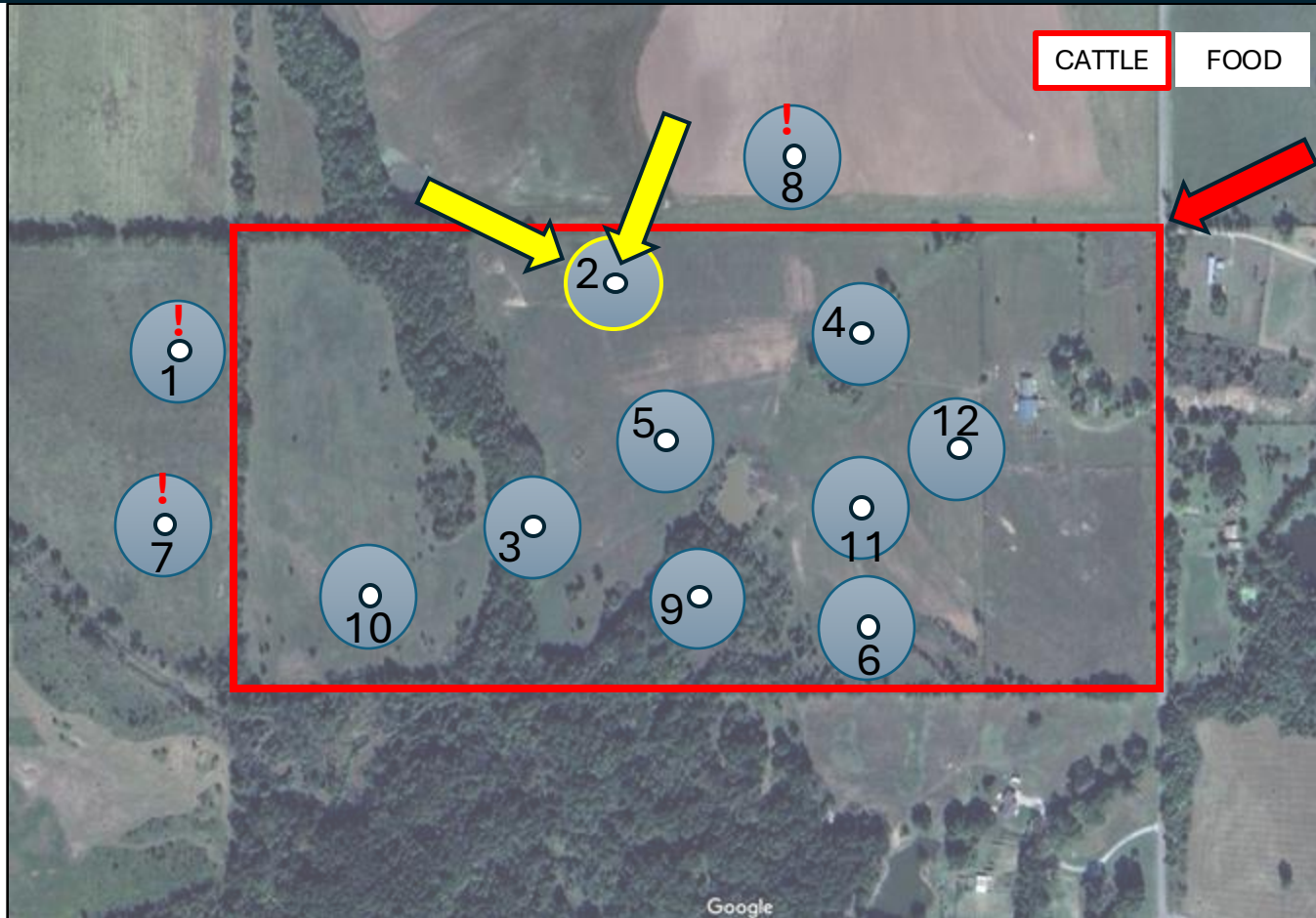
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- ☐ Cow 11
- ☐ Cow 12



## BESSIE (AI ASSIST)

How can I Help?

I...



CATTLE

FOOD

## Drone Control



55%

Flight Path File:  
[2\\_2\\_25fltpth.px4](#)

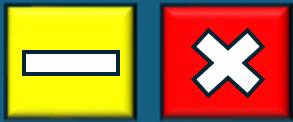
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PULL DATA

```
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>>
```



## Cattle Select

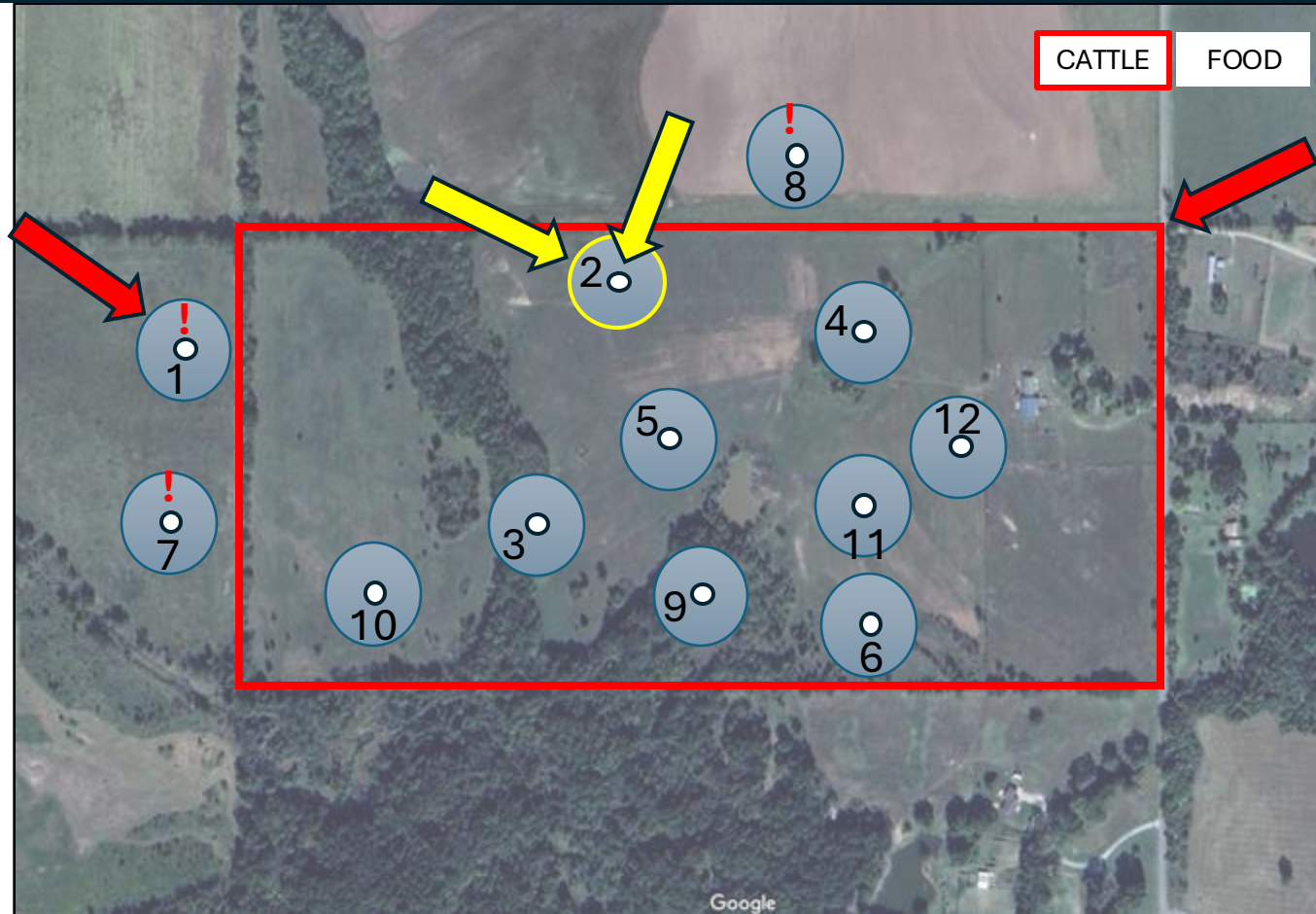
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How can I Help?

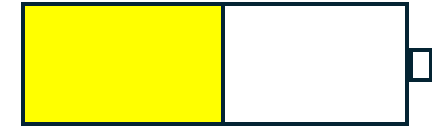
I...



CATTLE

FOOD

## Drone Control



55%

Flight Path File:  
[2\\_2\\_25fltpth.px4](#)

REQUEST  
FLIGHT

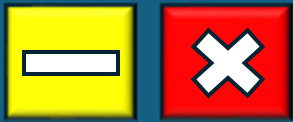
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PULL DATA

```
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- ☐ Cow 1 ! 
- ☐ Cow 2
- ☐ Cow 3
- ☐ Cow 4
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- ☐ Cow 6
- ☐ Cow 7 ! 
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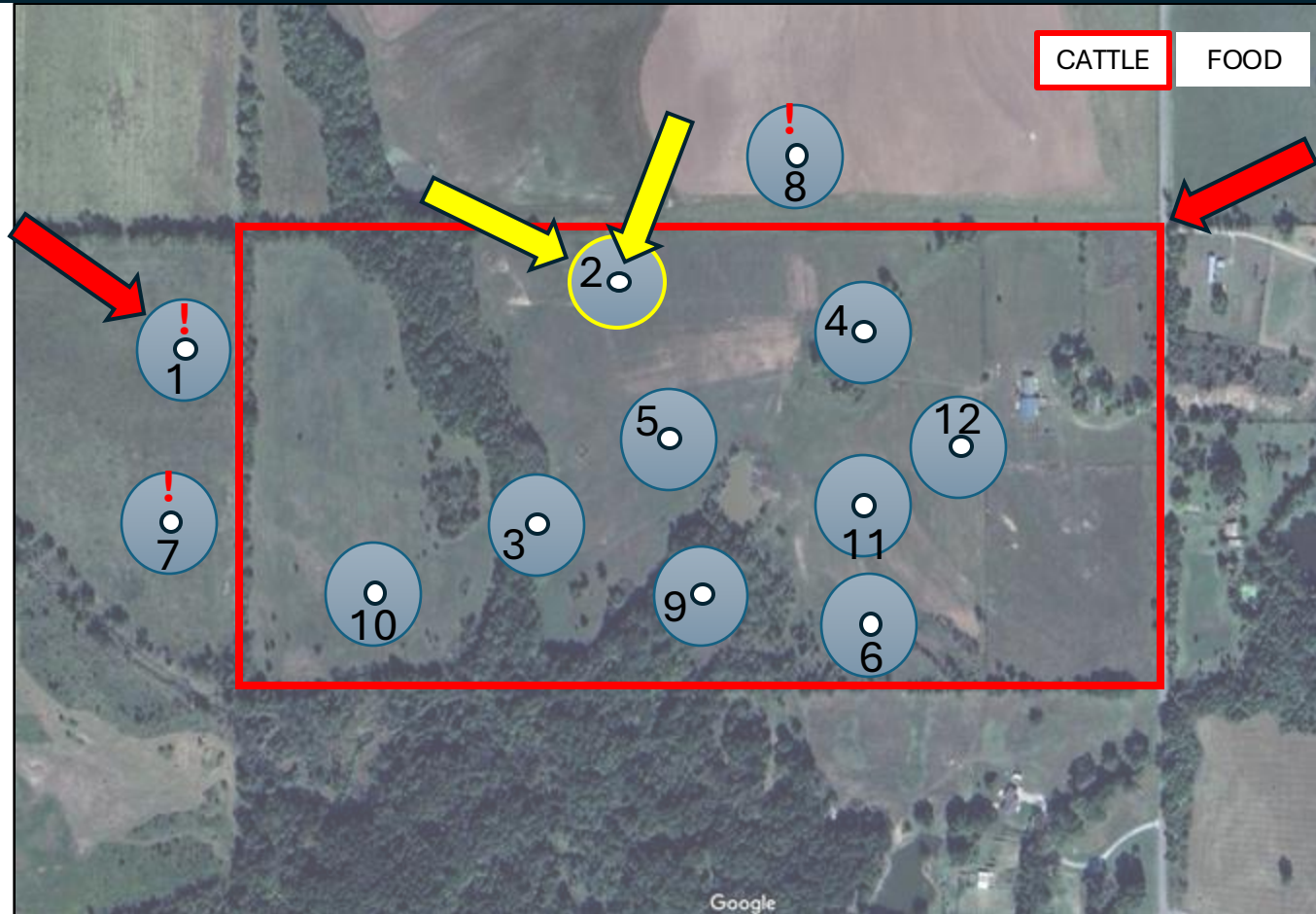
## BESSIE (AI ASSIST)

How can I Help?

I...

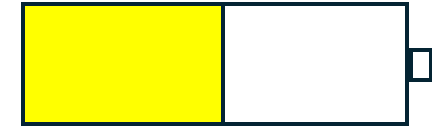
CATTLE

FOOD



```
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55%

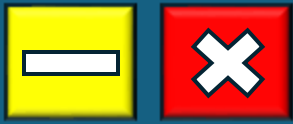
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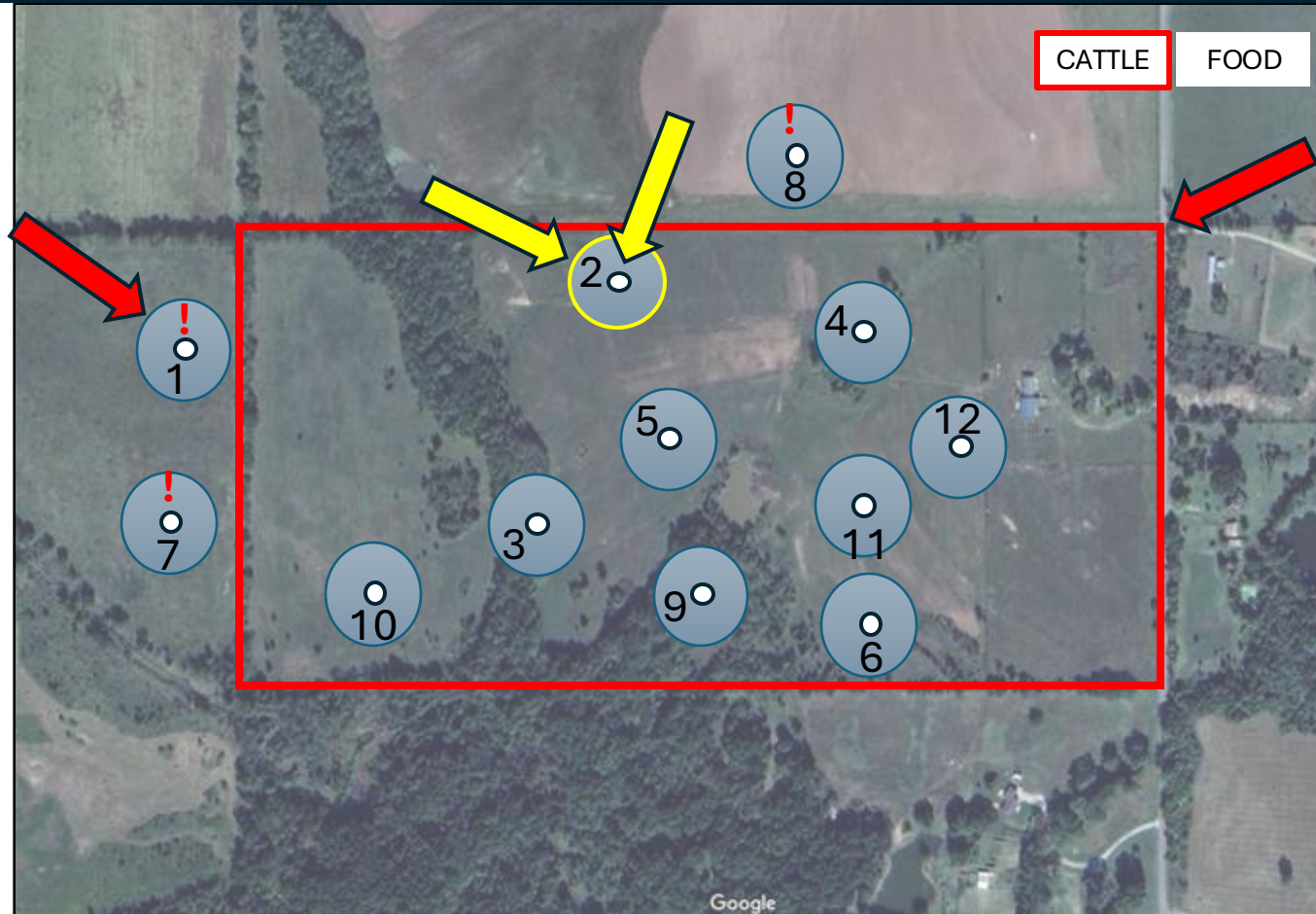
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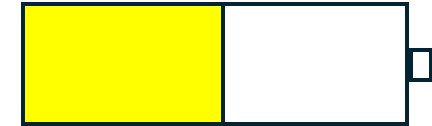
I...



CATTLE

FOOD

## Drone Control



55%

Flight Path File:  
[2\\_2\\_25fltpth.px4](#)

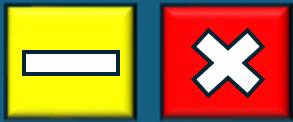
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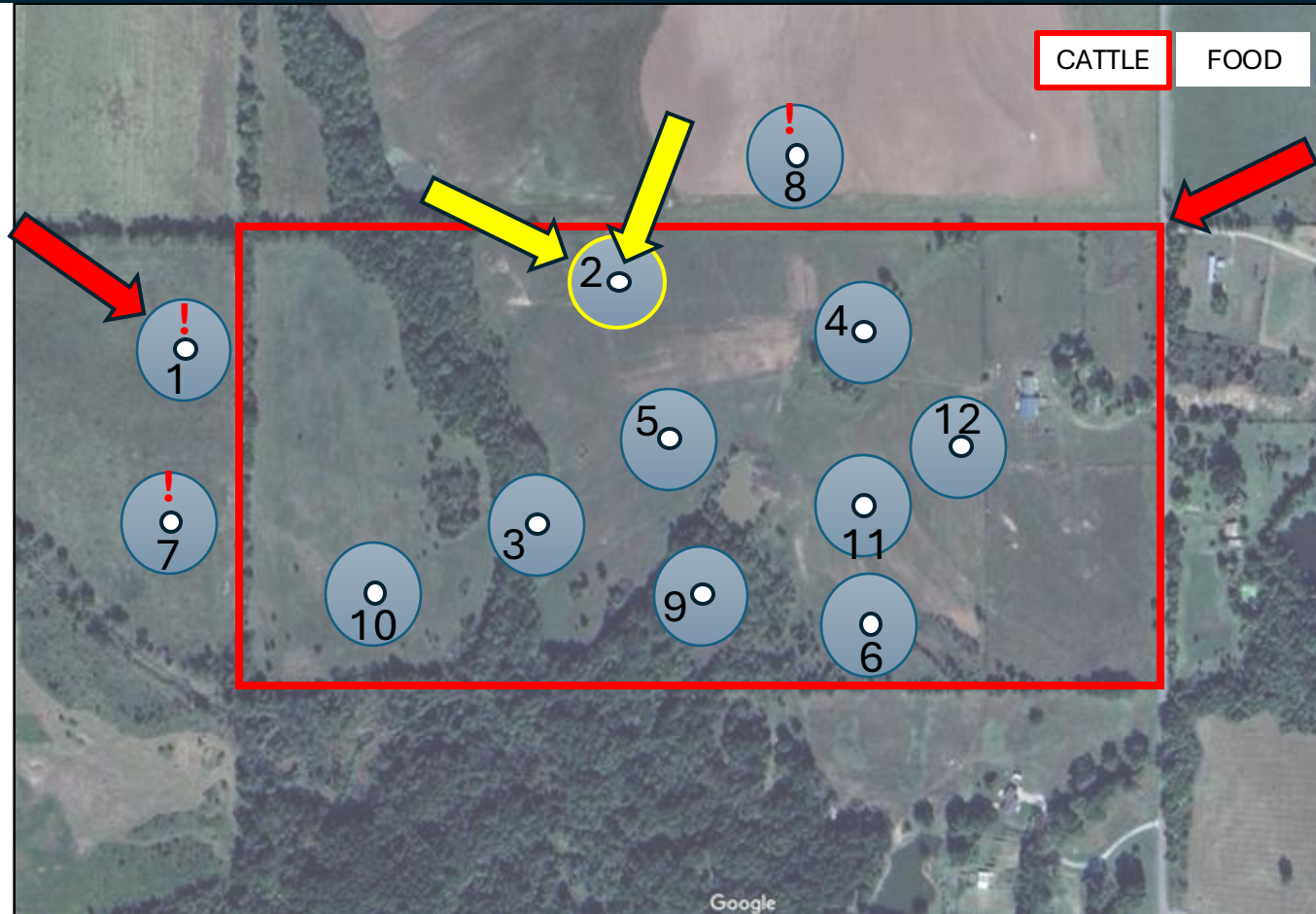
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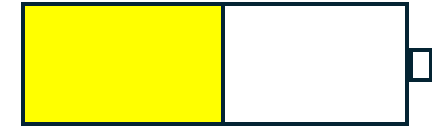
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55%

Flight Path File:  
[2\\_2\\_25fltpth.px4](#)

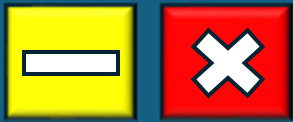
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## Cattle Select

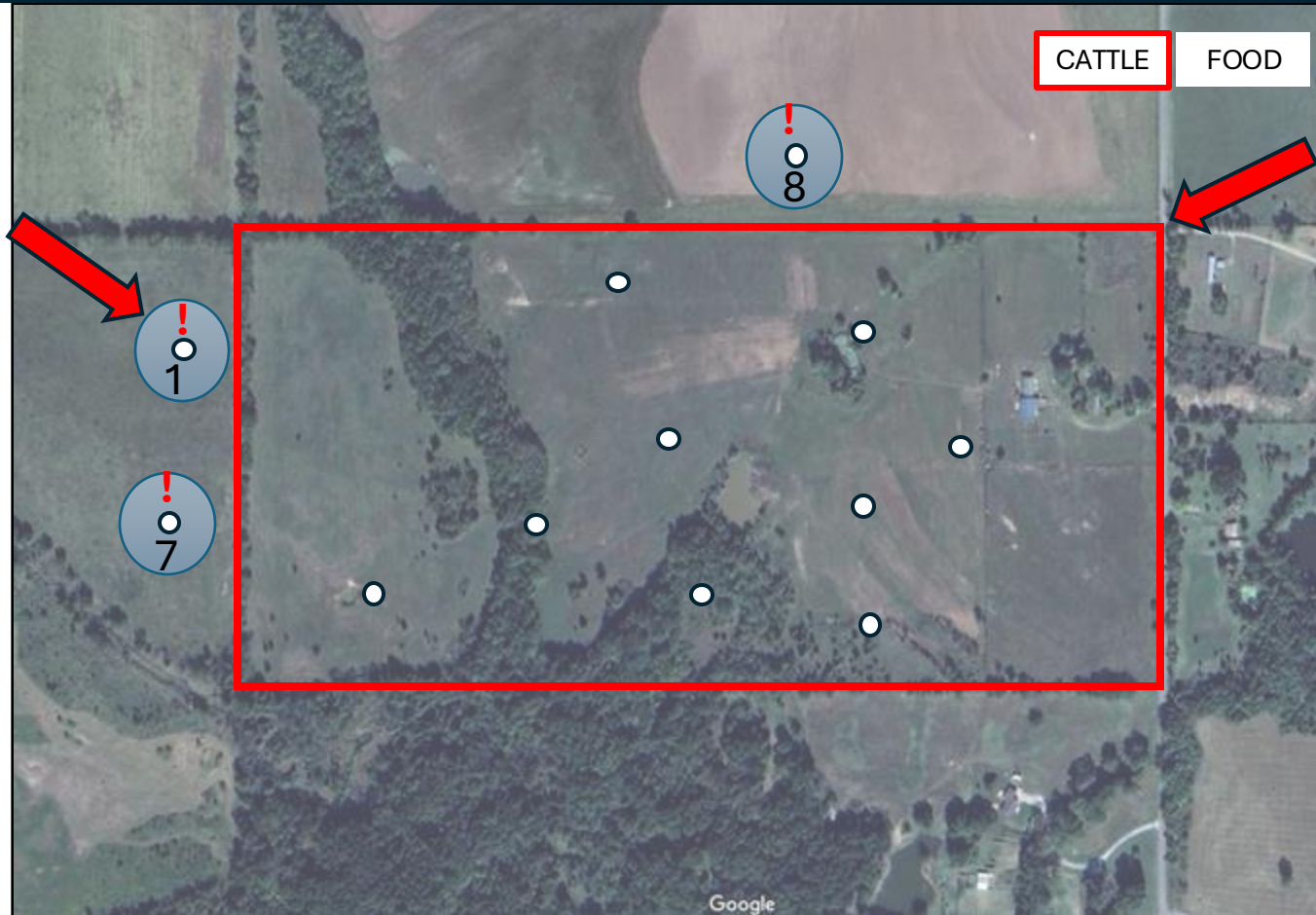


- ☒ Cow 1 ! ←
- ☒ Cow 2
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- ☒ Cow 12

## BESSIE (AI ASSIST)

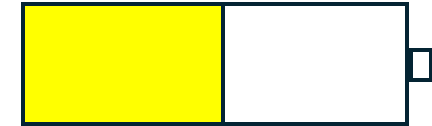
How can I Help?

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```

## Drone Control



55%

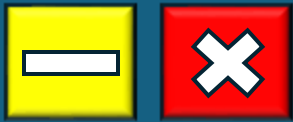
Flight Path File:  
[2\\_2\\_25fltpth.px4](#)

**REQUEST  
FLIGHT**

Allow Drone to  
land safely..

Connect Drone..

**PULL DATA**



## Cattle Select



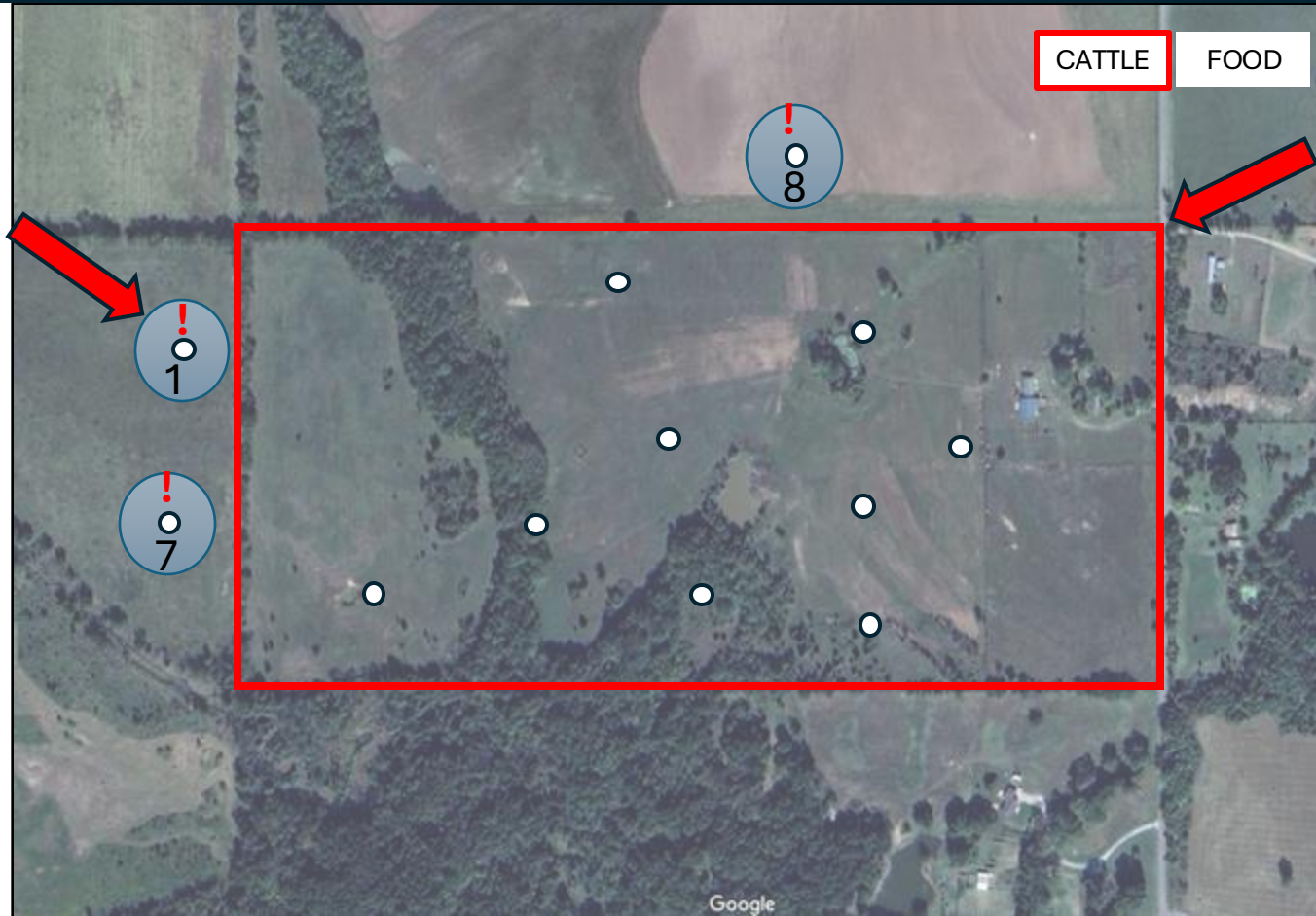
- ☒ Cow 1 ! ←
- ☒ Cow 2
- ☒ Cow 3
- ☒ Cow 4
- ☒ Cow 5
- ☒ Cow 6
- ☐ Cow 7 ! ←
- ☐ Cow 8 ! ←
- ☒ Cow 9
- ☒ Cow 10
- ☒ Cow 11
- ☒ Cow 12



## BESSIE (AI ASSIST)

How can I Help?

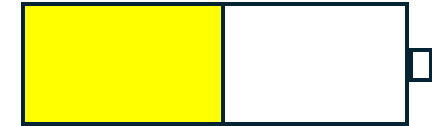
I...



CATTLE

FOOD

## Drone Control



55%

Flight Path File:  
[2\\_2\\_25fltpth.px4](#)

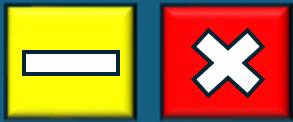
REQUEST  
FLIGHT

Allow Drone to  
land safely..

Connect Drone..

PULL DATA

```
>> PROGRAM RUN..  
>> DATA DISPLAYED..  
>> 3 FLAGS!... ←  
>>
```



## Cattle Select

- ☐ Cow 1 !
- ☐ Cow 2
- ☐ Cow 3
- ☐ Cow 4
- ☐ Cow 5
- ☐ Cow 6
- ☐ Cow 7 !
- ☐ Cow 8 !
- ☐ Cow 9
- ☐ Cow 10
- ☐ Cow 11
- ☐ Cow 12



## BESSIE (AI ASSIST)

How can I Help?

I...

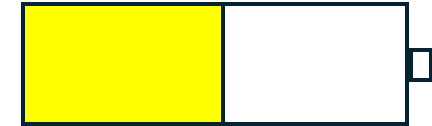
CATTLE

FOOD



```
>> PROGRAM RUN..  
>> DATA DISPLAYED..  
>> 3 FLAGS!..  
>>
```

## Drone Control



55%

Flight Path File:  
[2\\_2\\_25fltpth.px4](#)

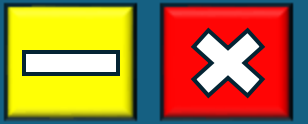
REQUEST  
FLIGHT

Allow Drone to  
land safely..

Connect Drone..

PULL DATA





## Cattle Select

- ☐ Cow 1 !
- ☐ Cow 2
- ☐ Cow 3
- ☐ Cow 4
- ☐ Cow 5
- ☐ Cow 6
- ☐ Cow 7 !
- ☐ Cow 8 !
- ☐ Cow 9
- ☐ Cow 10
- ☐ Cow 11
- ☐ Cow 12



## BESSIE (AI ASSIST)

How can I Help?

I...

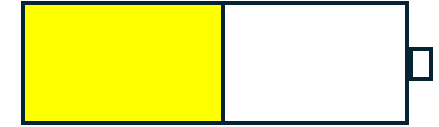
CATTLE

FOOD



```
>> PROGRAM RUN..  
>> DATA DISPLAYED..  
>> 3 FLAGS!..  
>>
```

## Drone Control



55%

Flight Path File:  
[2\\_2\\_25fltpth.px4](#)

REQUEST  
FLIGHT

Allow Drone to  
land safely..

Connect Drone..

PULL DATA

# Graphical User Interface

- Extra Features:
  1. Integrated Large Language Model
  2. Links to Website and Help Documents
  3. Offline Data Printouts
  4. Health Detail Review and Warning Sign Flags



# Graphical User Interface

- Estimated maximum development cost of ~\$92200.
- \$30.00 software overhead to recoup cost, provided sales goals are met.





# Website

- Online hub for support and legacy data backups.
  - Access your data anywhere!
- Mobile Device Compatible
- Q&A Forums
- Online Storefront
- Links to Social Media Pages



# CattleLog

Need Help?



Rancher Log  
Forum

Monitoring and tracking your  
herd based on your needs, at  
the push of a button!

Need To  
Manage?



Login

Want to Help?

**Bringing the Innovation of Cattle Management to you!**

## Available Products

Full Package: 1 – GPS Drone w/ Base Station & lifetime  
software, 100qty - RF Cattle Tags, 1 – Ear Tag Tool

Price (before tax): **\$4,000**

Learn More About This Package [Here](#)

Expansion Package: Configurable Tag qty – 5,10,25,50,100+  
Optional Ear Tag Tool

Price (before tax): **Varies**

Learn More About This Package [Here](#)

Developer Package: Deconstructed GPS Drone w/ Base  
Station & lifetime Software, (qty) 100 – RF Cattle Tags, 1- E...

Price (before tax): **\$4,000**

Learn More About This Package [Here](#)

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tracking your herd  
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Need Help?



Rancher Log  
Forum

Need To  
Manage?



Login

Want to Help?





A desktop browser window showing the CattleLog website. The address bar displays 'WWW.CattleLog.com'. The main heading is 'CattleLog'. Below it, a large blue box contains the text 'Monitoring and tracking your herd based on your needs, at the push of a button!'. To the left, a circular button with a stack of books icon is labeled 'Need Help? Rancher Log Forum'. To the right, a circular button with a bull head icon is labeled 'Need To Manage? Login'. A red arrow points to the 'Need Help?' button. Below the main heading, a yellow button says 'Want to Help?'. At the bottom, a dark blue banner reads 'Bringing the Innovation of Cattle Management to you!'. Below this is a table titled 'Available Products'.

Available Products	
Full Package: 1 – GPS Drone w/ Base Station & lifetime software, 100qty - RF Cattle Tags, 1 – Ear Tag Tool	Price (before tax): <b>\$4,000</b> Learn More About This Package <a href="#">Here</a>
Expansion Package: Configurable Tag qty – 5,10,25,50,100+ Optional Ear Tag Tool	Price (before tax): <b>Varies</b> Learn More About This Package <a href="#">Here</a>
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A mobile phone screen showing the CattleLog website. The address bar displays 'WWW.CattleLog'. The main heading is 'CattleLog'. Below it, a large blue box contains the text 'Monitoring and tracking your herd based on your needs, at the push of a button!'. Below this, there are two circular buttons: one with a stack of books icon labeled 'Need Help? Rancher Log Forum' and another with a bull head icon labeled 'Need To Manage? Login'. At the bottom, a yellow button says 'Want to Help?'.




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<>⌂↺WWW.CattleLog.com🔍☰☆

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Want to Help?

Need To Manage?



Login

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Rancher Log Forum

Need To Manage?



Login

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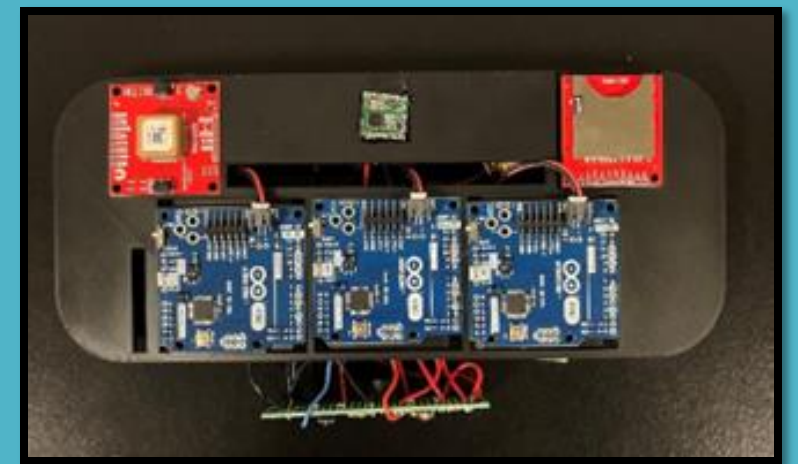
Login

Want to Help?



# Prototyping

- Our Capstone Project



# Implementation



# Sales Goal

- 1% of Small Cattle Farms adopt the system by 2035.
- ~17000 systems sold
- Expansion and further development contingent on progress towards this goal.



2025	2027	2029	2031	2033	2035
<div>Initial Milestones:</div> <div>Product Soft Launch</div> <div>Site &amp; Software Launch/Publishing</div>	Farm Trials				
	Attend Various Farming Expos				
	Product Demos				
	Seeking/Open to Investment				
		Establish Location In Tulsa		& Full Launch	
		Publish		Drawings	
			Employ Continuous Improvement & Gather Volunteers		
				Expand to Medium & Large Farms	
	Beta Phase		Launch Phase		

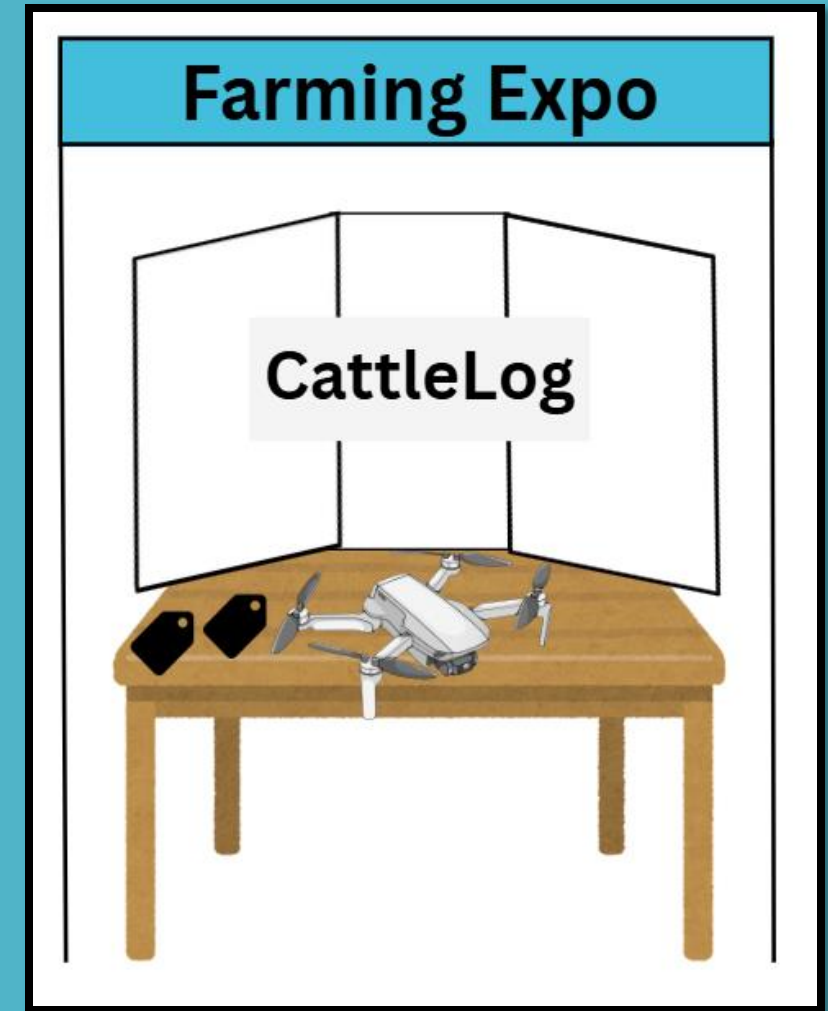
# Beta Stage – Farm Trials





2025	2027	2029	2031	2033	2035
<div>Initial Milestones: Product Soft Launch</div> <div>Site &amp; Software Launch/Publishing</div>	Farm Trials				
	Attend Various Farming Expos				
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			Employ Continuous Improvement & Gather Volunteers		
				Expand to Medium & Large Farms	
	Beta Phase		Launch Phase		

# Beta Stage – Farming Expos












2025	2027	2029	2031	2033	2035
<div>Initial Milestones:</div> <div>Product Soft Launch</div> <div>Site &amp; Software Launch/Publishing</div>	Farm Trials				
	Attend Various Farming Expos				
	Product Demos				
	Seeking/Open to Investment				
		Establish Location In Tulsa		& Full Launch	
		Publish		Drawings	
			Employ Continuous Improvement & Gather Volunteers		
				Expand to Medium & Large Farms	
	Beta Phase		Launch Phase		



# Beta Stage – Product Demos





2025	2027	2029	2031	2033	2035	
Site & Software Launch/Publishing 	Farm Trials					
	Attend Various Farming Expos					
	Product Demos					
	Seeking/Open to Investment					
Initial Milestones: Product Soft Launch		Establish Location In Tulsa		& Full Launch		
		Publish		Drawings		
			Employ Continuous Improvement & Gather Volunteers			
				Expand to Medium & Large Farms		
	Beta Phase		Launch Phase			

# Beta Stage – Seeking Investment

- Economic Development Administration awarded \$51 million to Tulsa<sup>6</sup> for development of autonomous technologies





2025	2027	2029	2031	2033	2035
<div>Initial Milestones:</div> <div>Product Soft Launch</div> <div>Site &amp; Software Launch/Publishing</div>	Farm Trials				
	Attend Various Farming Expos				
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		Publish		Drawings	
			Employ Continuous Improvement & Gather Volunteers		
				Expand to Medium & Large Farms	
	Beta Phase		Launch Phase		

# Launch Stage – Company Location

- Establish Brick and Mortar Location in Tulsa OK
- Cities in the Midwest like this are seeking to expand their tech sectors.
- Ample investors and support.

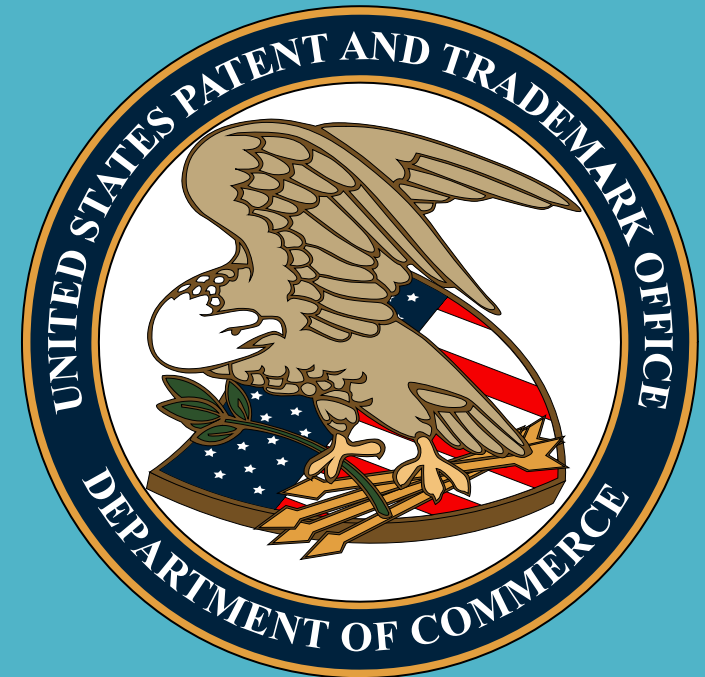


2025	2027	2029	2031	2033	2035
<div>Initial Milestones:</div> <div>Product Soft Launch</div> <div>Site &amp; Software Launch/Publishing</div>	Farm Trials				
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	Seeking/Open to Investment				
		Establish Location In Tulsa		& Full Launch	
		Publish		Drawings	
			Employ Continuous Improvement & Gather Volunteers		
				Expand to Medium & Large Farms	
	Beta Phase		Launch Phase		



# Launch Stage – Publish Drawings

- Finalized Designs patented and published.
- Designs updated based on user group testing.



2025	2027	2029	2031	2033	2035
<div>Initial Milestones: Product Soft Launch</div> <div>Site &amp; Software Launch/Publishing</div>	Farm Trials				
	Attend Various Farming Expos				
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	Seeking/Open to Investment				
		Establish Location In Tulsa		& Full Launch	
		Publish		Drawings	
			Employ Continuous Improvement & Gather Volunteers		
				Expand to Medium & Large Farms	
	Beta Phase		Launch Phase		

# Launch Stage – Employ Continuous Improvement and Volunteers

- Rehire software developers long-term
- Train and expand autonomous drone pilots





2025	2027	2029	2031	2033	2035
<div>Initial Milestones:</div> <div>Product Soft Launch</div> <div>Site &amp; Software Launch/Publishing</div>	Farm Trials				
	Attend Various Farming Expos				
	Product Demos				
	Seeking/Open to Investment				
		Establish Location In Tulsa		& Full Launch	
		Publish		Drawings	
			Employ Continuous Improvement & Gather Volunteers		
				Expand to Medium & Large Farms	
	Beta Phase		Launch Phase		

# Expanded Farm Size Packages

	Small Farms		Medium-Large Farms	
Component	Description	Cost	Description	Cost
Drone	DJI Air 3S or Equivalent	\$1,415.97	Drone Fleet - Assume x5	\$6,370.00
Tags/Beacons	x 100	\$3,137.00	x 350	\$8,844.50
Software	Supports Up to 100 Cattle	\$30.00	Supports Up to 1000 Cattle	\$30.00
Drone Modifications	x 1	\$114.66	Assume x 5	\$573.30
Total	\$4,697.63		\$15,817.80	

# Affordability

Tag			Receiver			Drone			Software	
Component	Cost	Vendor	Component	Cost	Vendor	Component	Cost	Vendor	Component	Cost
ATMega328	2.89	<a href="#">Sparkfun</a>	Arduino x3	32.85	<a href="#">Sparkfun</a>	Drone + Controller	1274.00	<a href="#">DJI</a>	Software Overhead	\$30.00
Battery x1	6.48	<a href="#">EEMB</a>	Battery x2	12.96	<a href="#">EEMB</a>	Battery x3	85.98	<a href="#">Hobby King</a>	TOTAL	\$30.00
RF Module	6.5	<a href="#">Sparkfun</a>	RF Module	6.5	<a href="#">Sparkfun</a>	Multispectral Camera	59.99	<a href="#">Amazon</a>		
Case	1.00	CattleLog	GPS Module	49.95	<a href="#">Sparkfun</a>	TOTAL	1419.97			
O-Ring	1.25	<a href="#">Home Depot</a>	SD Card Module	5.5	Sparkfun					
PPG Sensor	4	<a href="#">Amazon</a>	Button x2	0.2	Digikey					
Thermistor	0.32	<a href="#">Digikey</a>	Piezobuzzer	0.7	Digikey					
Solar Panel	9	Sparkfun	Case	9.98	CattleLog					
TOTAL	31.44		SD Card	5.00	CattleLog					
TOTAL X100	3144		Case	9.98	<a href="#">Walmart</a>					
			TOTAL	133.62						
							SYSTEM TOTAL COST		\$4,697.63	



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# THANK YOU!



NASA'S

G A T E W A Y S T O

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